

BECOMING VIRTUAL:
BODIES, TECHNOLOGIES, WORLDS

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ABSTRACT

This thesis addresses how virtual reality technologies are being developed to shape a cultural politics of embodiment and subjectivity across local and global contexts. The research considers a number of approaches to understanding the techno-cultural changes and political dilemmas presented by virtual systems. Undertaking a critical consideration of these approaches, the thesis argues that virtual systems are neither 'demonic' technologies, nor transcendent cultural forms, but rather complex and deeply embedded social and cultural networks.

Employing multi-sited ethnographic methods, the thesis investigates virtual reality technologies as technical systems, cultural narratives and commodity forms. As the analysis moves across a number of locations — including entertainment centres, manufacturing firms, art galleries, home offices and electronic/digital spaces — the connections between those locations become apparent. The analysis proposes that identifying these connections is a crucial step in mapping out a critical politics of virtual systems. The research concludes by arguing that such a politics is a politics of positioning, which is both oppositional, but is also cognisant of the sometimes contradictory workings of power in constructing techno-cultural alliances.

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I am a sociologist because sociology spoke to me strongly of human passion — about ‘our’ loves, our dreams, our hopes, our fears, our lives and our deaths. This journey has been a story of a life and a self, as well as of a research project. I have met many along the way, a cast of thousands, who in their myriad, uncanny guises have offered me so much — humour, oddity, understanding, friendship, wonder and passion. I owe them all my thanks.

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Life never tires of great surprises.

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January, 1999

Becoming Virtual:

Bodies, Technologies, Worlds

TABLE OF CONTENTS

Abstract	ii
Acknowledgements	iii-iv
Table of Contents	v-vi
List of Figures	vii-ix
 SECTION ONE: PROBLEMATISING THE VIRTUAL	
Chapter One: Becoming Virtual: Introduction	1
Chapter Two: Problematising the Virtual: Questions, Cases, Research Problems	15
 SECTION TWO: EXPERIENCING THE VIRTUAL	
Introduction	43
Chapter Three: 'Reading' the Virtual: Worlds, Texts and the Politics of Subjectivity	49
Chapter Four: 'Writing' the Virtual: Machines, (Inter)Action and the Politics of Embodiment	88
Conclusions	131

SECTION THREE: LOCATING THE VIRTUAL

Introduction	140
Chapter Five: Consuming the Virtual: Spectacles, Disciplines and the Politics of Pleasure	144
Chapter Six: Selling the Virtual: Objects, Commodities, and the Politics of 'Culture Industries'	180
Conclusions	213

SECTION FOUR: BUILDING THE VIRTUAL

Introduction	216
Chapter Seven: Organising the Virtual: Networks, Markets and the Politics of Positioning	224
Chapter Eight: Producing the Virtual: Artefacts, Design and the Politics of Technics	269
Conclusions	309

SECTION FIVE: ANALYSING THE VIRTUAL

Chapter Nine: Revisioning the Virtual	314
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METHDOLOGICAL SECTION

Studying the Virtual I: Fields, Analysis and the Politics of Knowledge	330
Studying the Virtual II: Participants, Sites and the Politics of Fieldwork	352
Notes	380
Bibliography	412

List of Figures

Chapter One: Becoming Virtual

1-1	Virtuality® 'Pod'	3
1-2	Virtuality® 'Visette'® - Head Mounted Display	4
1-3	Virtual Technologies' 'Cyberglove'™	5

Chapter Two: Problematising the Virtual

2-1	Virtuality®'s 'Second Generation' 'Pod'	25
2-1	OSMOSE© Tree and Clearing	26
2-3	Placeholder - The Hoodoos	27
2-4	'Garage' VR Equipment	28
2-5	Cyberedge Journal	30
2-6	'Cyberspace'	34
2-7	Mondo 2000	35
2-8	Wired	36

Chapter Three: Reading the Virtual

3-1	Digital Jobe from <i>The Lawnmower Man</i>	51
3-2	Dactyl Nightmare™	55

3-3	Participant's view of Dactyl Nightmare™	56
3-4	Bodies of Dactyl Nightmare 2™	57
3-5	'Jack', a Simulated Human	58
3-6	Legend Quest™	61
3-7	The Lovers in <i>The Lawnmower Man</i>	63
3-8	Forest in OSMOSE©	65
3-9	OSMOSE© Schematic	66
3-10	Waterfall in Placeholder	69
3-11	Don's doubled identities	74
3-12	Gridbusters™	79

Chapter Four: Writing the Virtual

4-1	Virtual i-o® i-glasses™	90
4-2	Datagloves in Cyberspace from <i>Johnny Mnemonic</i>	91
4-3	<i>Ms.</i> magazine Fax Advertisement	97
4-4	<i>Virtual Reality and the Exploration of Cyberspace</i>	98
4-5	Participant's representation of Sega Netmerc	102
4-6	The dominance of vision in virtual reality	104
4-7	OSMOSE© Breathing Vest	106
4-8	'Action' in Virtuality®	111
4-9	'Action' in Virtuality®	122

Chapter Five: Consuming the Virtual

5-1	Virtual Geographic League membership card	149
5-2	Consuming pleasure in virtual reality technologies	153
5-3	The construction of 'fun' in entertainment sites	154
5-4	Virtuality Café, Berlin	158
5-5	Cybersmith Education Concept	160
5-6	Relations of 'the gaze' in entertainment sites	165
5-7	Constructing 'the future' through pod, screens and props	167
5-8	Picard as 'Locutus' Borg in <i>Star Trek</i>	169
5-9	OSMOSE© installation space	172
5-10	Placeholder installation space	173
5-11	The spectacular 'immersant' in OSMOSE© installation space	173
5-12	'Because Reality Sucks' Cybermind advertising	175

Chapter Six: Selling the Virtual

6-1	Virtual Worlds Entertainment® Ltd. Storefront	186
6-2	Virtuality® 'Preplay' and 'Replay' Stations	189
6-3	Virtuality®'s magazine, <i>Without Walls</i>	192
6-4	Manual of Safe Operations, Virtuality®	196
6-5	The labour of Placeholder Installation	198
6-6	Placeholder's Goddess at work	200

Chapter Seven: Organising the Virtual

7-1	Virtuality®'s First Commercial HMD	238
7-2	Metaphors of Birth in VR	248
7-3	Metaphors of Birth in VR	249
7-4	Programmer from OSMOSE© in Placeholder	256
7-5	Cybermind Franchise Advertising	260
7-6	Virtual World Entertainment Chain Store Advertising	261
7-7	Silicon Graphics® Onyx™	264

Chapter Eight: Producing the Virtual

8-1	System Diagram	278
8-2	Trout Mask Head Mounted Display	291
8-3	Baseball Bat Haptic Feedback Device	292
8-4	Cybernose	293
8-5	The Mattel® Powerglove™	297
8-6	'Garage' Built Glove	299

Chapter Nine: Revisioning the Virtual

Fig. 9-1	VR and the World	329
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Nothing ever begins.

There is no first moment; no single word or place from which this or any
other story springs.

The threads can always be traced back to some earlier tale, and to the tales
that preceded that; though as the narrator's voice recedes the connections
will seem to grow more tenuous, for each age will want the tale told as if it
were of its own making.

Thus the pagan will be sanctified, the tragic become laughable; great
lovers will stoop to sentiment, and demons dwindle to clockwork toys.

Nothing is fixed. In and out the shuttle goes, face and fiction, mind and
matter, woven into patterns that may have only this in common: that hidden
amongst them is a filigree which will with time become a world.

Clive Barker *Weaveworld*

Becoming Virtual:

Bodies, Technologies, Worlds

Errata

SECTION ONE: PROBLEMATISING THE VIRTUAL

Chapter One

Page 2, line 36, 'site of social through' should read 'site of social discipline through'

Chapter Two:

Page 20, line 10, 'non-pspecialised' should read 'non-specialised'

Page 22, line 36, 'interationist' should read 'interactionist'

Page 29, line 2, 'object/ technologies' should read 'objects/ technologies'

Page 30, line 16, 'range of industry.' Should read 'range of industry relationships.'

Page 34, line 15, '*Cyberpunk*' should read '*Cyberpunk* (1990)'

Page 39, line 4, 'history and was embedded' should read 'history and were embedded'

SECTION TWO: EXPERIENCING THE VIRTUAL

Introduction

Page 45, line 5, 'while they were 'in' it.' should read 'while they were 'in' them.'

Chapter Three

Page 67, line 27, 'sounds designed' should read 'sounds are designed'

Page 75, line 14, 'cathesix' should read 'cathexis'

Page 75, line 16, 'postion' should read 'position'

Page 76, line 22, 'television film' should read 'television, film'

Page 81, line 31, 'Decontruction' should read 'Deconstruction'

Page 81, line 33, '45Addison.html.' should read '45Addison.html).'

Page 82, line 11 'Such a cyborg politics' should read 'Such cyborg politics'

Page 86, line 21, 'Baurillard' should read 'Baudrillard'

Chapter Four

Page 93, line 17, 'presence' 'action'' should read '"presence', 'action''

Page 94, line 15 'economic cultural' should read 'economic, cultural'

Page 105, line 1 'manoeuVRe' should read 'manoeuvre'

Page 121, line 19, 'pecualiarities' should read 'peculiarities'

Page 127, line 17, 'determined ones' should read 'determined ones.'

Conclusions

Page 134, line 20, 'Participant's' should read 'Participants''

SECTION THREE: LOCATING THE VIRTUAL

Introduction

Page 141, line 33, 'offer virtual' should read 'offer the virtual'

Chapter Five

Page 179, line 14, 'turn to' should read 'turn'

Chapter Six

Page 198, line 11, 'illustrate' should read 'illustrated'

Page 204, line 14, 'Deconstructon' should read 'Deconstruction'

Page 204, line 18, 'artists' should read 'artist'

SECTION FOUR: BUILDING THE VIRTUAL

Introduction

Chapter Seven

Page 234, line 2, 'advertisment' should read 'advertisement'

Page 242, line 6, 'rationalised of a commodity' should read 'rationalised commodity'

Page 266, line 3, 'are expecially important' should read 'are especially important'

Page 267, line 32 'collectivity of thecompany' should read 'collectivity of the company'

Chapter Eight

Page 302, line 14, '... illegitiate. Some ...' should read '... illegitimate, some...'

METHDOLOGICAL SECTION

Studying the Virtual I

Page 333, line 13, 'this necessarily' should read 'this is necessarily'

Notes

Page 380, line 3, 'differeces' should read 'differences'

Page 380, line 9, 'desplaces' should read 'displaces'

Page 383, line 24, 'Electornics' should read 'Electronics'

Page 384, line 8, 'its physicality.' should read 'its physicality).'

Page 384, line 17, '"difference' a defined' should read '"difference' as defined'

Page 385, line 11, 'mDactyl' should read 'Dactyl'

Page 386, line 24, 'individuals an collectivities' should read 'individuals and collectivities'

Page 393, line 11, 'subject/ objects' should read 'subject/ object'

Page 409, line 29, 'Instead, relied more' should read 'Instead, I relied more'

Section One

ProblematISING the Virtual

1

Introduction

Becoming Virtual

No-one knows what forces draw two people together. There are plenty of theories; astrology, chemistry, mutual need, biological drive ... Shortly the pseudo-lab coat approach of dating by details will make way for a genuine experiment whose results, however unusual, will remain controllable. Or so they say. (See splitting the atom, gene therapy, in vitro fertilisation, cross hormone cultures, even the humble cathode ray for similar statements.) Never mind. Virtual Reality is on its way. ...

If you like, you may live in a computer created world all day and all night. You will be able to try out a Virtual life with a Virtual lover. You can go into your Virtual house and do Virtual housework, add a baby or two, even find out if you'd rather be gay. Or single. Or straight. Why hesitate when you could simulate? ...

For myself, unreconstructed as I am, I'd rather hold you in my arms ... The scientists say I can choose but how much choice have I over their other inventions? My life is not my own, shortly I shall have to haggle over my reality. Luddite? No, I don't want to smash the machines but neither do I want the machines to smash me.

Virtual reality (VR) technologies are positioned at the nexus of some of the most widespread cultural and technological changes in contemporary societies. What 'the virtual' is, and how western persons are currently 'becoming virtual', have become pivotal questions with the ongoing expansion of computer technologies into everyday life (Terry and Calvert, 1997; Stone, 1996; Silverstone and Hirsch, 1992; Mansell and Silverstone, 1996). Immersive virtual reality technologies in particular are implicated as significant sites of social and cultural change (Lévy, 1998; Schroeder, 1996; McKie, 1994).¹ Furthermore, virtual technologies and the worlds they create seem to confound easy conceptual assumptions about what constitutes 'economy', 'culture' and 'technology'.

On the one hand, virtual reality technologies are iconic of the new computing and communication technologies whose development is increasingly transforming how we organise everything from the global economy (Castells, 1996, 1997a;) to our most intimate relationships (Springer, 1996; Stone, 1996; Turkle, 1995). On the other hand, virtual worlds are technical manifestations of existing cultural logics. Immersive virtual reality technologies have become a focus for concerns about how media forms reflect, as well as produce, the ways that social subjects understand their selves, their bodies and their social worlds. Lévy (1998) argues that 'virtualization' involves not technical objects per se, but cultural logics/ processes which can be coupled with technical systems, which intensify changes in cultural texts, in bodies and the constitution of collective identities. What is 'new' about new computing and communications technologies such as VR, is a *recognition* of their transformative potential (Clarke, 1995: 149).²

Boundaries of all kinds are potentially disrupted by the techniques and logics of virtual technologies. These technologies are media which proliferate systems of signs in a 'hyperreality' (Baudrillard, 1980, 1983). The self-referentiality of representations offer deep challenges to how 'self' and 'other', 'reality' and 'unreality' are understood in contemporary cultural communities. How the representations offered by virtual worlds construct identity and difference constitutes a cultural politics of virtual systems. Such simulations exist alongside the increasing regulation of those selves and realities at the level of the body. Alongside subjectivity, bodies become a more concentrated and intense site of social through technical systems which engage and work on humans' physical substance. Organic embodiment is

potentially penetrated and deconstructed, as well as regulated, by new information, communication and computer technologies in what some call a movement towards the 'post-human' (Halberstam and Livingston, 1995).

In highly mediated and technologically saturated societies then, categories of personhood, embodiment and knowledge are potentially reworked, de- and re- constructed. How this might happen in particular virtual systems, what bodies are affected by those processes, and who benefits thereby, are the stakes in a digital and artefactual 'bio-politics' (Haraway, 1992). This research project asks how the interaction of VR technologies and existing notions of subjectivity and embodiment offer transformative potential, but also hold the potential to reproduce existing cultural forms.



Fig. 1-1
 Virtuality® 'Pod':
 An immersive virtual system
Mondo 2000 (1992) p. 253
 © Mondo 2000

Virtual Reality Technologies

How do virtual systems³ maintain and/ or challenge dominant categories of techno-social experience? How do they create contradictory moments where

new configurations of embodiment, self and experience of worlds might become possible? Where are these politics currently being played out? To address these questions, I direct my attention to immersive virtual reality technologies. Because 'virtual reality' technologies are computing and new communications technologies which mediate subjects in concentrated ways, and because 'immersion' intensively engages the body at the intimate surfaces of the human organism, I chose to focus on immersive virtual systems as an iconic but operative techno-cultural form (see Fig. 1-1).

Immersive virtual realities can be conceptualised in their 'strongest' (Heim, 1998) sense as human-computer interaction via particular software and hardware configurations.⁴ Immersive virtual realities attempt to simulate immersion in digital or 'cyber' space — the 'space' created by information. Human perception, at least in terms of seeing, hearing, and touching, is linked to computer graphic simulations of virtual worlds through head mounted displays, data gloves and data suits.



Fig. 1-2
A Virtuality® Head Mounted Display: 'Visette'®
Virtuality (1993) p. 9
© Virtuality® Ltd.

The head mounted display communicates visual information, and consists of computer graphics run through stereoscopic video screens which, through the vagaries of human visual perception, are viewed by the user as three dimensional images (see Fig. 1-2).

Aural stimulation is provided by stereo headphones in the head mounted display, which provide computer generated sound in three dimensions, again, the product of human auditory perception. ‘Data gloves’ provide a sense of touch when moving in virtual space (see Fig. 1-3). These gloves act as interactive intermediaries in the virtual world between computer generated constructs and human bodies. Datagloves, through attached ‘trackers’, input information to the computer as to the orientation of body parts — in this case, the hand — and simultaneously provide tactile feedback of objects in the virtual world. This concept extends to the development of datasuits, which, although in their infancy, are expected to extend this feedback principle across the whole body. As many researchers are aiming to produce fully immersive and interactive virtual worlds, a full body suit, which gives whole body orientation information to the computer, and sensory tactile feedback for the whole body, is seen as the most ‘desirable’ development goal for many VR researchers (Aukstakalnis and Blatner, 1992: 172).

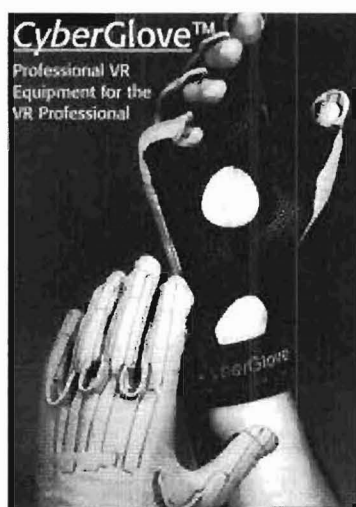


Fig. 1-3
Virtual Technologies'® 'Cyberglove'™
© Virtual Technologies

My interest in immersive virtual systems began in my own living room, in a small city in the lower North Island of New Zealand, in 1994. I first encountered virtual reality technologies via another media — the ubiquitous television set. An intrepid reporter was investigating violence and pornography on the internet, and included a segment at the end which speculated on the impact of digital mayhem in everyday life should immersive virtual reality technologies⁵ become the interface for long distance — ‘telepresent’ — sex.

I was both fascinated and mildly horrified by the thought, and this first inkling of what immersive virtual reality was and what it might do set off a whole string of questions. I was intrigued by the notion of the worlds made possible through virtual technologies, and the frameworks provided by the shape and form of those worlds for human experiences of subjective embodiment. What kinds of bodies and subjectivities were possible in these worlds? Was it possible to expand experiential horizons through these worlds, to subvert dualistic framings of experience, to take on different kinds of embodiment, change practices of gender or sexuality by performing embodiment in different ways through creating simulated environments and simulated bodies? How could the embodied and experiential possibilities provided by these worlds be run through, and change other sites of embodied social practices in non-programmed worlds?

My curiosity finally led me to seek out a virtual reality system to experiment with, which ultimately meant seeking out a machine in an entertainment centre. I participated in a virtual world, duly considered this an opportunity to 'technologize the self' (Probyn, 1992, 1993), and wrote about my experiences. They are worth relating here:

The thought of entering a virtual world was uneasy for me — an excitement, a danger, an uncertainty after all I'd read about 'cyberspace' ... It was rather a disconcerting experience to see most of 'me' rendered in digital form, but moving around as I would in the space I usually filled. When I looked down, I could see my feet, and when I brought my hand up with the gun to wave it in front of my face, it all appeared in my vision — arm, hand, and gun clenched in my fist. While this was disturbing in an exciting kind of way, other feelings were disturbing in a hazardous kind of way. The fact that my other arm and hand were all but non-existent in this world prompted a sense of uneasiness, as did the realisation that no matter how far I moved my head, there were parts of my body that I was unable to see, parts that I was used to seeing as well as feeling and moving.

This sense of dislocation between worlds became acute when I attempted to explore the virtual world by taking a walk. The set of manoeuvres required to move about in the virtual world quickly became apparent. When I attempted to move, I initially walked forward ... I remembered swiftly that I couldn't do this here, reminded by the tug of the cord on the back of the belt around my waist. So I pushed the button on the top of the gun, and to my surprise and pleasure, I moved forward. What a sense of achievement in so simple a move! I saw movement across the central board. This was presumably my opponent. He looked as chunky and squarish as I did, and he was moving across the board, periodically disappearing behind the pillars as he did so.⁶ When he came at me, my whole fantasy of competence failed miserably. I attempted to move towards him, but did so with my legs rather than with my buttons. I turned around at the same time, keeping track of him as he moved around in a curve towards me, and found that I had turned completely around without even realising it and that I was now tangled in the cord which attached the belt to the pod. I was conscious of my body engaged in a sonnambulant shuffle trying to extricate myself from the tangle, having to execute a three-

sixty degree turn as I did, a far cry from the action pictures which had accompanied my build-up to the event. I finally faced him somewhere along the line and fired in desperation ...

Quite suddenly, and without warning or transition, the world froze. And as the world ceased moving, I did as well: Was this some kind of new transition, where I would again be thrown into a different world, another world beyond my own making, beyond my control, and which would disorient, confuse, and frustrate me? I suddenly realised that the game was over. This moment was one of both relief and disappointment: Relief because entering this world had been hard work, and adrenalin inducing, full of confusing creatures which included my own body: Disappointment because I still felt as if I knew very little about the world that I had been in (Fieldnotes, Auckland, January 1995).

I had indeed been catapulted into a different world, one which was not of my own making, aspects of which were beyond my control, and which excited, disoriented, exhilarated and frustrated me until I reoriented again to the more everyday movements and practices of my body. The experience resonated with the processes Becker (1963) describes as his participants learned to become marijuana users, and thus 'outsiders'. I felt ambivalent about my experiences, the ambiguous meanings produced by the digital world, and the context in which I encountered it. I was both excited and tired, my senses in both worlds had expanded and contracted, I had fun and got confused, I both believed the game and was critical of it, I was both competent actor and confused recipient, both in control of my actions and having no control over my body, my environment, my world. My embodiment bore the physical, psychical and social effects of 'becoming virtual'.

Methods and Themes

How was I to understand what had happened to me, what kind of experience I had had, and how it was produced? What framings could I bring to these experiences?

This thesis represents one partial response to this question. The research seeks to understand the techno-cultural changes and political dilemmas presented by virtual reality technologies. Throughout the research I treat virtual realities as both sets of material and symbolic relations, *and* as 'imaginary social worlds'. In this latter aspect they are similar to other culturally elaborated imaginary activities such as our personal stream of consciousness, our dreams, media imaginaries, hallucinations or play (Caughey, 1984; see also Huizinga, 1949; Goffman, 1972). Virtual systems

are therefore both ‘actual’ social practices in material worlds carried out through face to face relations, and opportunities for ‘possible’ social relations, imaginaries comprised of interactive fantasies of personal and generalised others, incorporating persons and abstractions who may or may not ‘exist’ in everyday life.

This multiplicity of form draws attention to the conventional problems with defining technologies purely and simply as ‘objects’. As Judy Wajcman (1991) notes, ‘technology’ has different, layered meanings which are used in specific ways at particular times. Firstly, technology refers to sets of physical objects. Secondly, technology implies forms of knowledge. Technological objects have no meaning in and of themselves without forms of knowledge and meaning — closely connected to scientific understandings — to create, manipulate, make sense of and use them. Finally, and most importantly for this research, Wajcman (1991: 14-15) notes that

“Technology” also refers to what people do as well as what they know. An object such as a car or a vacuum cleaner is a technology, rather than an arbitrary lump of matter, because it forms part of a set of human activities. A computer without programs and programmers is simply a useless collection of bits of metal, plastic and silicon.

If one accepts that ‘technologies’ are not only objects, but also sets of knowledges, networks of social meanings and practices, and the power relations which emerge from struggles in these spheres (MacKenzie and Wajcman, 1985; Wajcman, 1991, 1994), then virtual reality technologies can be thought of as a complex assemblage of social and technical processes played out in the simulation of experiences. This understanding underscores the centrality of the meeting between technological artefacts and human beings. I would argue that it also opens up our understanding of technologies as fundamentally political practices; the networks of practice in virtual realities involves the construction of selves, experiences, worlds, objects, meanings, organisations and bodies, across technical, cultural and economic spheres of social activity.

The thesis attempts to map the techniques used to construct these relations, and the identities and differences which attend them. Throughout the research I developed a method which moved from the starting point of the encounter between myself and a virtual system, along the networks of connections between the multiple sites/ locations where virtual realities are

produced and consumed. Identifying these connections is a crucial step in mapping out a critical politics of virtual systems.⁷

I initially reflected on how I made sense of what it had meant for me to ‘become virtual’, and what tools I could bring to the task of understanding some of the complexity involved in my thoughts, my feelings, my actions, and the visceral responses of my body in the VR system. I was working from the principle that experience is not something that is uniquely personal, but also social (Jackson, 1992; Scott, 1992; de Lauretis, 1987): and also that ‘experience’ is not originary, but rather, what needs to be explained. Because my own experiences were the starting point of my inquiry, it also seemed important to interrogate the ways that technocultures are ‘located as much in the work of everyday fantasies and actions as at the level of corporate or military decision making’ (Penley and Ross, 1991: xiii).

I was interested in looking at virtual processes that cohered around experiences, lived bodies and narratives of the virtual. Because of these concerns, my research was conducted via ethnographic methods to provide a layered richness and depth of research materials. These research practices situated the research at the level of ‘everyday life’ (de Certeau, 1984). Locating the research across local sites of ethnographic exploration examines how everyday life is becoming reworked in the name of ‘the virtual’. Situating virtual technologies as ‘everyday’ crucially identifies ‘the virtual’ as a matter of *practice* and of *process*, and connects those practices and processes with already existing and mundane/ habitual worlds.

I wanted to investigate how these relationships I had entered into — with the machine, with other people, with places and with texts and images — were made possible. I began looking for places to study by searching for information/material on the particular games system that I had tried at a location-based entertainment centre in Auckland, New Zealand. I decided that the easiest way to begin to locate ethnographic sites of ‘virtual reality’ was to trace the ‘evolution’ of this artefact from my experience with it in the Auckland arcade to the network of others whose activities produced it, and still others who distribute it and consume it in different places.

The journey⁸ that began with this artefact eventually took me halfway around the world,⁹ examining many of the sites, locations, texts and social interactions that were conceivably associated with this object, its creation and its use. It seemed that my decision to look across multiple sites, and to trace dispersed relations was the way the field itself worked, as well as an epistemological and methodological goal (see Methodological Section). Along

the way, I encountered other objects and stories which led me down various paths in the networks of connection amongst technologies and their worlds. As the analysis moves across a number of locations — including entertainment centres, manufacturing firms, art galleries, home offices and electronic/ digital spaces — the connections between those locations become apparent. I was told stories about art and human creation, visited education centres as well as museums; watched digital worlds emerge in living rooms, read novels, walked the floors at trade shows, listened to lectures, lurked on bulletin boards, read glossy industry magazines, perused company reports and went to movies about VR. The thesis is, in large part, a story of that research journey.

It is, however, also an epistemological and analytical journey. The research maps three major themes in the politics and processes of ‘becoming virtual’: struggles over the control and regulation of the material technical systems designated ‘immersive virtual reality technologies’, the control and regulation of ideological/ discursive markers of identity, difference and meaning in the digital spaces they produce, and the control and regulation of knowledge about, and bodily disciplines of, ‘virtual’ embodiment. What is at issue is the conceptualisation and analysis of how those struggles are formed and carried out.

In one frame, the cultural, symbolic and narrative elements of virtual practices, and the connections of these with people’s understandings of themselves and their worlds, suggested a feminist poststructuralist approach, emphasising discourses and the productivity of discursive fields for the generation of knowledges and categories of person. The interactive aspects of the technologies, their position as material systems embedded in economic exchanges and technical disciplines lent themselves to ‘actor-network’ approaches situated in science and technology studies. Such approaches focus not only on discourses and their institutionalisation, but also on how specific human and non-human actors build networks of relations through which technologies emerge. They insist on the symmetry of all ‘actors’ in the network, whether global or local.

Some feminist theorists maintain a distinction between these two approaches, particularly concerned by the epistemological and political implications of actor network theory for feminist agendas. As Ormrod (1995) notes however, both are species of ‘post-structuralism’ in that they question foundationalist formulations of ‘the real’ and how knowledge of ‘the real’ is derived. My struggles with how these analytical approaches frame

virtual reality technologies, and their relation to each other, has shaped the form of this thesis. In this sense, the way the thesis is presented here reflects my journey into these analytical issues, and how I have attempted to address them.

Chapter Outline

The journey into the theoretical issues generated by analysing virtual reality technologies frames the discussion of the themes explored through this research. The thesis is organised into three substantive sections, each of which is bracketed by an introduction and conclusion which discuss the theoretical problems at issue in each section. Section One introduces the questions and issues which will be discussed throughout the thesis. Section Two focuses on the processes involved in ‘Experiencing the Virtual’, Section Three examines issues around ‘Locating the Virtual’, and Section Four addresses how ‘Building the Virtual’ is organised and carried out. The thesis concludes with some remarks about how, in light of this research, we might go about ‘Revisioning the Virtual’. Finally, a section on method — ‘Studying the Virtual’ — reflects on the methodological issues both peculiar to virtual systems research, and their points of contact with enduring themes in sociological, feminist and science and technology research.

Immediately following this introduction, Chapter Two introduces the ‘cases’ on which the research is based, and briefly touches on a discussion of the construction of ‘the field’, and the epistemological issues at stake in ‘Studying the Virtual’ which are elaborated in the methodological section. Chapter Two positions the analytical themes of the thesis with respect to contemporary fields of research on virtual reality technologies, and indicates how these themes are woven through later, substantive chapters.

Section Two addresses the processes of ‘Experiencing the Virtual’, and the analytical focus of the section is how to conceptualise virtual reality technologies as both media and objects. In Chapters Three and Four of this section I address how ‘virtual identities’ are generated from the stories, narratives, actions and identities made available through interplays between bodies and VR systems. The bodies interacting with machines are already themselves the effects of cultural, economic and technical histories, constituted through discourses and practices of bodily desires, pleasures and identities. Power, as an effect of the encounter, had different effects for

different bodies, and generates a range of meanings about ‘becoming virtual’ that engage bodies in a number of ways. Analytically, I argue that the most effective means of holding an analysis of media representations, and an analysis of phenomenological objects in tension, is to concentrate on how those practices are carried out locally by participants in those systems. While addressing such local strategies of constructing the virtual is useful, this analysis must also be embedded in some consideration of the contexts in which this human-machine interaction takes place.

In Section Three, ‘Locating the Virtual’, I trace the connections between particular systems and experiences with their location in particular social sites. This consideration is framed through a discussion of how the institutionalisation of virtual reality technologies is achieved as a social process in diverse sites, and how this can be understood by drawing from analytical work at the juncture of consumption and production. In Chapters Five and Six, I argue that the encounters between people and VR systems discussed in the previous section are multiply contested in local and concrete sites of use through textual and organisational intermediaries. I examine how the sometimes contradictory practices of consumption, economic rationality, and digital mediation are grounded in familiar power relations, while also producing new relations which have uneven effects for those participating in VR consumption and distribution. I argue that distributors, in particular, present analytical dilemmas for those analysing new computing and communications technologies. This group of people/ places are simultaneously part of production and consumption networks. As such they provide a useful point of exploration for how theories of consumption, and theories of technical production might meet.

Section Four, entitled ‘Building the Virtual’, explores connections established between sites of distribution, and the organisations, places and processes through which virtual reality technologies are built. Analytically, the section is framed in terms of the utilities of feminist, constructionist and ‘actor-network’ approaches to understanding technical production, and the generative tensions between them. In Chapters Seven and Eight I turn to examine the physical and organisational construction of virtual systems, and the frameworks of institutionalised interaction and discourse that are used to build/ inscribe technical objects. Chapter Seven focuses on the issues of resourcing, markets and economic organisation (both competition and cooperation), and maps the broad similarities as well as local contingencies in VR production. Here I argue that the economic contingencies of producing

virtual systems as commodity artefacts is a central consideration in any discussion of the identities and experiences that virtual worlds produce; ‘production’ and ‘consumption’ are so intimately reciprocal in local networks that theorising one without the other in virtual worlds production is problematic. Chapter Eight considers how technical expertise, discourses and frameworks of technical practice are embedded in the professional practices of virtual worlds builders. Research in local settings indicates that while professional discourses and tacit technical knowledges frame technical practice, local technology projects remain open and contingent – especially as those involved position themselves in multiple ways with respect to a number of technical frameworks.

‘Revisioning the Virtual’ concludes the thesis by arguing for situationalist practices of virtual world building, and a more diverse and reflexive politics that addresses how persons are currently ‘becoming virtual’. Such a politics is a politics of positioning, which is both oppositional, but is also cognisant of the sometimes contradictory workings of power in constructing technocultural alliances. Virtual systems are neither ‘demonic’ technologies, nor transcendent cultural forms, but rather complex and deeply embedded social and cultural networks which can work for an inclusive and democratic politics of cultural transformation, and a reflexive politics of technical possibilities and limits.

A Note on Conventions

Throughout the thesis, I have been concerned to tell a number of simultaneous stories, and in doing so to question the authority of ‘experience’, or the ontological treatment of ‘reality’, as originary. I have therefore positioned a number of narratives against each other.

Some of these narratives are my own. This includes the straightforward ‘academic’ text of ‘the thesis dissertation’, written in an analytical style familiar to those scholars in the social sciences and humanities. The narratives of others are woven through this story: the talk, stories, myths, images and humour which I encountered, or of which others gave so generously in the course of research. In the Methodological Appendix I discuss how those texts are a collaborative construction, and reflect on how such stories get told.

Other stories in this thesis are more problematic. I have included a whole string of ‘scenes’ throughout the thesis, textual worlds which describe places and are inhabited by people. Some of these are derived from fieldnotes, others are imaginary, some are both. Some include people I met, some are imaginary characters, some are composites of a range of characters that have inhabited the physical and digital worlds I encountered throughout my research. Through the use of these problematic texts, and by positioning layers of text against each other, I hope to make some productive connections: to ‘destabilise’ and fragment the construction of a smooth and coherent narrative which achieves closure. My intention is to draw attention to the *multiple* stories which can be told about virtual reality technologies, and to indicate that this is only one of many political interventions that might be made in the field.

The epistemological approaches which prompt such manoeuvres in my research and writing, the worlds I explored to make these stories, and the questions I asked as I did so, are the issues addressed in the next chapter.

Problematizing the Virtual:

Questions, Cases, Research Problems

Rue rubbed the heel of her hand across her eyes, and then under her nose. ‘*You* don’t like the information revolution because it’s wiping out your world; how they did things in your day!’

‘I wasn’t aware my day was over,’ Valentine said ... ‘Sweetheart, I think your cyberpunk dystopias are infinitely fragile and valuable. Looking at technology on its own is naïve. The old power structures can swallow hacker anarchy and never burp.’

Mary Gentle *Left To His Own Devices*

Power can be invisible, it can be fantastic, it can be dull and routine. It can be obvious, it can reach you by the baton of the police, it can speak the language of your thoughts and desires. It can feel like remote control, it can exhilarate like liberation, it can travel through time, and it can drown you in the present. It is dense and superficial, it can cause bodily injury, and it can harm you without seeming ever to touch you. It is systematic and it is particularistic and it is often both at the same time. It causes dreams to live and dreams to die. We can and must call it by recognizable names, but so too we need to remember that power arrives in forms that can range from blatant white supremacy and state terror to “furniture without memories.”

Avery Gordon *Ghostly Matters*

When I first encountered virtual reality technologies, my imagination was captured by possibilities for the creation of fantastic worlds which could be inhabited. I imagined these as worlds of wonder and exploration where alternative digital versions of self and community could exist. I imagined

them growing by experimenting with socio-cultural and institutional arrangements which would be different to (and an improvement on) sometimes oppressive networks of power relationships which endure in western cultures.¹ My rather utopian enthusiasm was, however, situated alongside a far more critical feminist and sociological approach to social life which insisted on the intimate and necessary connections between present and future, on particularity and locality in the formation of social worlds, and on an expectation of sometimes contradictory social formations which have unpredictable effects.

While virtual realities can be worlds of fantasy and imagination, they are also — materially and immediately — technical systems. As such they are connected to already existing social worlds, as well as forming new social relationships. As technologies, virtual reality systems are not singular, but rather heterogeneous (Law, 1987), especially because virtual reality technologies are computer systems, and therefore comprised of numerous component technologies. These technologies are explicitly put together as mutable systems rather than as singular material artefacts. Virtual reality technologies are also heterogeneous in their general development across time and geographical space, as well as their specific and concrete instances. A range of systems have been developed for a wide range of purposes. In a small industry, however, the locations of that development are scattered throughout the globe.

Because virtual reality technologies are so multi-faceted and dispersed, it is inevitable that they become ‘multiple’ objects of study. Virtual systems have been analytically treated as phenomenological objects (Hayles, 1996; Sofia, 1995), as media (Dovey, 1996), as commodities in economic networks (Balsamo, 1996; Markley, 1996), as sites of research/ business and organisational activity (Schroeder, 1996), and as sites of social and cultural reproduction (Kramarae, 1995). My interest is in mapping the relationships *between* a technical system’s cultural, technical and economic aspects, *across* texts, discourses and the material world, both the continuities these connections maintain and the disruptions they prompt. How do virtual systems maintain and/ or challenge dominant categories of techno-social experience? How do they create contradictory moments where new configurations of embodiment, self and experience of worlds might become possible?

Stories I: Traffic across Boundaries and Borderlands

The boundaries between the subject, if not the body, and the “rest of the world” are undergoing a radical refiguration, brought about in part through the mediation of technology. Further ... the boundaries between technology and nature are themselves in the midst of a deep restructuring. This means that many of the usual analytical categories have become unreliable for making the useful distinctions between the biological and the technological, the natural and artificial, the human and mechanical, to which we have become accustomed.

Allucquere Roseanne Stone *Will the Real Body Please Stand Up?*

The challenges to social and cultural boundaries prompted by virtual reality technologies are multiple (Stone, 1991). It seemed obvious to me when I began this project that technologies which could generate worlds, and simulate people in them, interrogated physical and cultural ‘boundaries’ of various sorts. Virtual reality technologies seemed to embody a disruption to dichotomous categories of difference commonly employed and socially maintained — ‘self’ and ‘other’, ‘real’ and ‘unreal’, ‘human’ and ‘non-human’, ‘technology’ and ‘society’. My interest was in the struggles for control over meaning and subjectivity, bodies and knowledge of them which emerged from these border crossings. These precarious boundaries seemingly implied a means of reworking some of the ‘borders’ of identity and difference which produce exclusion and inequality — in spheres wider than simply those of technology production and consumption. They seemed to create a range of exploratory ‘borderlands’ (Anzuldúa, 1987) of subjectivity and embodiment. At the same time, virtual reality technologies seemed capable of reinforcing already existing hierarchies of knowledge, bodies and social subjects.

These struggles were over the control and regulation of three ‘orders’ of ‘things’ (Foucault, 1970): struggles over the control and regulation of the material technical systems designated ‘immersive virtual reality technologies’, the control and regulation of ideological/ discursive markers of identity, difference and meaning in the digital spaces they produce, and the control and regulation of knowledge about, and bodily disciplines of, ‘virtual’ embodiment. My interest was in how these struggles might be played out in ‘everyday’ worlds of artefact production and consumption: the networks of practice in which collective cultures, habits and identities are crafted.

Despite a concern to pay attention to concrete and material relations evident in some critical literatures (Kendrick, 1996; Markley, 1996), one

worrying *gap* in critical interrogations of ‘the virtual’ was a widespread absence of empirical, ethnographic work to examine how politics of immersive virtual reality technologies are played out across different objects, locations, and social worlds.² ‘Materiality’ was often invoked in abstract terms, giving me few concrete examples or specific instances of the activities of the bodies and technologies under scrutiny.³ What happens to our analysis of ‘the virtual’ when we attend to the ongoing and local materiality of the virtual, when we investigate the material processes involved in making virtual experiences in specific contexts? These gaps lent urgency to my questions about how people ‘do’ virtual reality technologies, where, and the kinds of empirical approaches which could address the contexts of both digital *worlds* and the *artefacts* to which they were attached. I was convinced of the need to document both a range of VR artefacts (and their ongoing redevelopment), as well as how people use these technologies, and thereby reinvent them (Bijker, 1997; MacKenzie and Wajcman, 1985).

The way I reflected on my own encounters with ‘the virtual’ in fieldnotes contrasted with many accounts that I had read about what it is like to become virtual, and how it is accomplished. I searched for accounts of those ambiguous moments that had seemed so central in my virtual experiences. Only a few analytical stories drew their focus from empirical and phenomenological accounts of becoming virtual (see Balsamo, 1996; Schroeder, 1996; Pryor and Scott, 1993).⁴ How people engage with technologies to generate social worlds, and how those worlds are enabled and lived from the point of view of those participating in them, are the central descriptive and analytical resources provided by these accounts. It seems that these stories hold rich potential for understanding how the virtual is becoming embedded in everyday social life. I saw the need for a research project which would explore how virtual experiences are constructed through interactions between computer and human elements of virtual systems, which would deconstruct the material and textual organisation of human and machine boundaries, and the power relations produced through them across the connections between a number of ‘everyday’ sites. Technologies (both complex and simple) *permeate* everyday life, and not only reflect but also produce mundane and habitual domains. Everyday life is a matter of *practice*. de Certeau (1984: xi) describes these practices as ‘ways of operating’ or ‘doing things’, in ‘common places’ and ‘ordinary language’. ‘Everyday life’ is, for de Certeau (1984: xii-xiii), a process of employing

bodily and subjective ‘strategies’ and ‘tactics’ to make ‘other’ of what has been provided by a socio-cultural milieu:

Everyday life invents itself by *poaching* in countless ways on the property of others ... To a rationalized, expansionist and at the same time centralized, clamorous and spectacular production corresponds *another* production, called “consumption”. The latter is devious, it is dispersed, but it insinuates itself everywhere, silently and almost invisibly, because it does not manifest itself through its own products, but rather through its *ways of using* the products imposed by dominant economic order.

I hoped the focus on social practice in ‘everyday life’ would draw out some of the simultaneously local and historically/ culturally defined aspects of biopolitics involved in virtual reality technologies (Smith, 1987). As Cartwright (1995: 221) notes, ‘[s]trategically, there is little to gain in representing modes of high technology as totalizing systems with little potential for local intervention. There is a need, instead, to focus on the moments of rupture and resistance ...’ My response to the paradoxes and boundary crossings presented by VR was therefore to construct an ethnographic project which would focus on these moments of rupture and resistance.

Stories II: Cases and Connections

Technologies are *social facts* and *sociological subjects* in so far as they are products of previous social activity and producers of future social activity. They should be considered ‘*technostructures*’ within the stream of social action rather than single and separate material means outside of society ...

Werner Rammert *New Rules of Sociological Method*

[T]he network of what we call ‘social’ relations is never purely social. For, though it is social, it is also and simultaneously technical, architectural, textual, and natural ... [T]o understand what it is that stabilises social relations to generate power we have ... to make sense of the way in which the ‘social’ interacts with and is constituted by these other materials. And, in particular, we have to explore the way in which discursive ordering strategies (in part) shape, and are embodied in a range of different materials.

John Law *Power, discretion and strategy*

Virtual reality technologies are not only heterogeneous systems with multiple aspects and attributes, but are radically *dispersed* technologies. They are geographically, socially and conceptually fragmented. The objects, images, texts, experiences and social relations of which they are comprised are scattered across a number of different institutional sites, including businesses

and industry, universities, media, schools and art worlds. In both their production and consumption, they are distributed throughout the world, and often the communicative or relational connections between them are digital as much as they are physical. The task became to identify how exactly I was going to 'access' the everyday worlds which constructed virtual experiences (see Methodological Section). One of my difficulties was that the places where virtual systems are located are generally highly specialised sites such as military or university computer laboratories. I had to identify the kinds of virtual experiences available to non-specialists. In doing so, the motivating questions became questions about how those particular non-specialised experiences are created, and what kinds of social processes contribute to their construction.

Another methodological difficulty I encountered was that it is possible to analyse VR simultaneously as an object, as technics, as a set of cognitive activities, as a sensory and perceptual apparatus, as representational or signifying media, and/ or as a set of myths and stories about humanity. Each of these ways of considering virtual reality technologies inevitably attributes certain roles, activities and importance to what it means to become virtual, and how that is achieved. This multiplicity make constructing a field of study around 'becoming virtual' problematic. Who is virtual, where and how? Where to begin?

I began to organise the research project around the multiple strategies of 'multi-sited' ethnographic methods (as expanded upon in the Methodological Section). Marcus (1995) argues that contemporary scholars of science and technology have begun to use methods which move across different social and cultural fields, tracing networks of scientific and technological practices in different, but connected, locales.⁵ Constructing ethnographic methods across different sites is an attempt to address some of the complexity and tangentiality of contemporary cultures in a global setting, and to shift conventional understanding of the 'local' and 'global', 'lifeworld' and 'system'. The most important result is that the *connections* become the 'object' of study (refer to Methodological section for extended discussion).

I have employed an approach which traces specific material and relational aspects of virtual reality technologies across a number of limited sites. As Marcus (1995: 106) argues,

Multi-sited ethnographies define their objects of study through several different modes or techniques. These techniques might be understood as practices of construction through (pre-planned or opportunistic) movement

and of tracing within different settings of a complex cultural phenomenon given an initial, baseline conceptual identity that turns out to be contingent and malleable as one traces it.

The advantages of using such an approach lie in its ease of movement across different social worlds, and the opportunities to examine the similarities and differences amongst them. This approach to ethnography pulls together a concern with the construction of local worlds, as well as their situation in the networks of institutional context. As such, it seemed an appropriate frame with which to address heterogeneous and geographically dispersed technologies. The focus on connections gives the researcher the flexibility to examine how different aspects of technical systems and their contexts are related to each other, and are connected across time and space.

I began searching for instances of ‘the virtual’ to study. As Latour (1987), Haraway (1991, 1997a), and Martin (1994) have variously suggested, connections between sites might be identified by following *objects*, by following *people*, and by following *stories*. Given my orientation to ‘becoming virtual’ as a process, as moments of negotiation in ‘everyday life’, I was particularly concerned to pursue these strategies by looking at experiences which came out of systems found in public spaces, as a complement to work which has concentrated on documenting specialised research and development work in VR.

Furthermore, addressing the complexity and multiplicity of virtual systems entailed searching for similarities and differences amongst artefacts, systems, and worlds, and the social contexts in which they were elaborated. I wanted to move across different sites and locations to describe interrelated networks of actors (individuals, groups, organisations) who participate in constructing experiences of the virtual. I wanted to look for the possibilities and constraints presented by the technologies and their institutionalisation for constructing virtual experiences. Identifying and evoking multiplicity in ‘the virtual’ offers the possibility for a complex and nuanced analysis of how VR is developed, built, diffused, exchanged and consumed.⁶ Such an analysis interrogates the formation of power relations in/ through virtual systems.

Similarity and difference amongst virtual technologies are embedded in already existing social worlds which are imbued with relations of power. The central concern with power relations in this project, and the workings of power in the production of bodies, persons and identities, are embedded in cross-disciplinary analyses of science and technology. A number of approaches in science and technology studies share a concern with power

relations (see, for example, Law, 1991, 1991a; Star, 1991), and focus on power relations by mapping networks of interpersonal and collective interaction in technology relations. Traditions of ethnographic sociology such as the Chicago School contribute to these understandings about how meaning, identities, the boundaries of selves and of groups are generated in 'everyday life' (Terry and Calvert, 1997; Silverstone and Hirsch, 1992).

In science and technology studies, ethnographic and interactionist approaches attempt to evoke the local, concrete and contingent aspects of technology in social worlds, to identify how technological cultures are collectively made, and how they are disrupted. These frameworks interrogate the power relations through which technologies become organisationally, economically, socially institutionalised, in what spaces, in what forms, and by whom. An ethnographic orientation was a means of tracing how a number of social worlds are connected via the deployment of symbolic resources, particularly the formation of discourses as 'meaning-making' processes in institutionalised contexts. The analysis draws on science and technology studies approaches which address a 'micro-politics' of embodiment and subjectivity in virtual worlds and technics. My analysis concerns itself with the ways social bodies and social subjects are produced locally, and in interaction, via technologies.

Feminist and poststructuralist approaches to cultural studies of science and technology⁷ offer a complement to constructionist and interactionist approaches, by shifting the focus of analysis to discursive exchange and its institutionalisation (Kipnis, 1993; Olalquiaga, 1992; de Lauretis, 1987), and to wider frameworks of power and knowledge which connect the practices of technologies across social worlds and sites (Menser and Aronowitz, 1996; Star, 1995). Feminist and poststructuralist approaches pay attention to the regulation of the body through intimate techniques of domination and resistance (Lyon, 1997; Bordo, 1993a), the role of language (Valverde, 1991; Weedon, 1987), the unconscious and desire (Sawicki, 1991) in the construction of social subjects. They manifest a concern to map the diffuse and 'productive' terrain of power relations, as well as its regulatory mechanisms (Foucault, 1973, 1979).⁸ Because these processes are located in the material regulation of bodies, space, place, time, and persons, they interrogate the power relations which attend the symbolic and discursive constructions of technical systems. I therefore brought both interactionist, and feminist poststructuralist approaches, as *complementary* orientations, to the process of gathering and analysing the research material.

It was the pursuit of the *practice* of technologies, how human bodies interacted with artefacts in various ways, which prompted me to follow the *objects* of virtual systems.

Following Objects

My interest in the analysis of virtual reality technologies and the power relations associated with their production and consumption was in contextualising the experiences that myself and others had when we used virtual reality technologies in particular sites. What had struck me most about my own virtual experiences were the intricate paradoxes which seem to lie at the heart of immersive virtual reality technologies, contradictions arising from the connections between human bodies and technical artefacts, and how worlds are constructed out of those connections.⁹ These objects or physical artefacts were, after all, what provided the parameters and possibilities of my experiences.

Cockburn (1992a) notes that the critique of technological determinism has become a commonplace amongst social theorists. Tracing physical artefacts is nevertheless one means to map the circulation of identity, meaning and power which connect different local instances of 'the virtual'. Appadurai (1986) notes that objects, things, cannot be separated or abstracted from the social organisation which produces and exchanges them. The form of the connections between humans and machines specifically emerges from the spaces between the 'subject(ive)' and the 'object'. This leaves them open to both dominant re-production, and counter-cultural re-inscription, via the deployment of discourses and technical practices already embedded in familiar objects.

Cheris Kramarae (1995) brings a critical feminist approach to virtual reality technologies by focussing on the social organisation in which they are already based. This approach addresses virtual reality technologies as, indeed, progenitors of change, but change which would maintain and reinforce practices of domination. Kramarae's (1995) argument is one amongst others which address the socially structured character of technical forms. Such arguments focus not only on the digital worlds produced by VR technologies (Kramarae, 1995), but most importantly on the locus of production of specific objects/ systems, and access to and effects of these objects as they diffuse (Brook and Boal, 1995). For these theorists, the 'celebration' of VR

technologies constitutes an ideological movement which ignores the already significant social inequalities which are mapped in/ on to virtual reality technologies.

Kramarae (1995) addresses both women's access to virtual systems, and the experience of the digital worlds such objects engender. She maintains that virtual worlds are limited by the imaginations of those who build the machines. Like other social theorists (see Stone, 1996), Kramarae points to the ways that VR programming, like other programming/ engineering, tends to be dominated by men, and that the assumptions that are made by men in these (especially gaming) subcultures tend to be both sexist and exclusionary (Stone, 1996; Ullman, 1996). While the dominance of men as both producers and consumers of these objects cannot be denied, to take one 'application' or set of products as representative of 'men' or 'masculinity' employs essentialist and foundationalist assumptions about the inevitability of men's connection with computing technologies and gendered experiences of those connections.¹⁰

One drawback of such an approach is that it typifies both objects and the actors involved in creating these technologies as monolithic entities, about whom abstracted generalisations can be made, despite the competing interests of multiple groups. I questioned whether VR systems could be decontextualised from the specific social worlds in which they were embedded and exchanged. I wondered also whether the objects and groups of people participating in virtual systems were quite as monolithic, or as homogeneous as was sometimes suggested. Following objects *across* sites allowed me to gain access to those spaces and connections between things and humans where the boundaries of meaning, action and value circulate.

Of those VR systems that I found which are publicly available, I focused on three systems (or clusters of systems) in the areas of entertainment, art and 'garage' VR.¹¹ I initially went back to my own experiences, to the games system that I had tried in Auckland, New Zealand, in 1995. I began to 'follow' this object through stories about it through the places in which it is distributed to the people who manufacture it. The technical system that I had first tried in Auckland was a Virtuality® CS ['CyberSpace'] 1000 unit, running a game called 'Dactyl Nightmare'TM. I found that Virtuality® produced other software, and other hardware (including the 'second generation' SU [stand up] 2000 unit, shown in Fig. 2-1), and distributed not only games for entertainment venues, but component technologies for business, training and marketing. In this way I began following objects constructed by participation

in, and distribution and manufacturing of, virtual systems. This process took me to corporate spaces and businesses, universities, publishing houses, professional and special interest associations, media, and telecommunications agencies.



Fig. 2-1
 Virtuality® 'second generation' pod
 ©Virtuality® Advertising

At the time of this research, Virtuality® Ltd. claimed 78% of the location-based entertainment market (<http://www.virtuality.com>), and was one of the most widely distributed immersive games systems. As well as moving into design, training, advertising and 'personal' — home/ pc based — applications, this firm has customers in location-based entertainment markets. I followed Virtuality® objects to these spaces, and they became sites for research: game arcades, amusement centres, theme parks and malls.

I visited arcades and 'Family Entertainment Centres' in Auckland, San Francisco and London, as well as Theme Parks in San Francisco, Boston and Walnut Creek. I visited cafés in Berlin and education centres in Boston, San Francisco and Christchurch. Some of these were 'franchise' type associations such as 'Cybersmith®' or 'Cybermind®', others were independent (Chapters Five, Six and Seven discuss these sites fully). I was not only interested in how such sites were economically and socially organised, but also the activities which took place in these locales. I was particularly interested in how

consumers/ participants connected with technologies at these sites, and used observation, participation and interviewing to consider the phenomenological and disciplinary effects of virtual reality technologies in such sites (as is illustrated in Chapter Four). As I followed Virtuality® objects to these sites, I encountered other entertainment systems, including a Sega® sub-contracted 'Netmerc' system, which I explore alongside Virtuality® throughout the thesis.¹²

Through industry commentators with whom I made contact at conferences and through telephone networking, I came to learn about the wider deployment of virtual systems into other social worlds. I also explored a world called OSMOSE®, produced by Char Davies at Softimage®, Montréal Canada. OSMOSE® is an interactive art work which uses an immersive virtual reality system to construct a world with twelve different 'dimensions' (see Fig. 2-2). This was a 'one-off' project at Softimage, designed for gallery installation, and has been installed at four different museums and galleries in the last three years: in Canada, the United States, and more recently, Europe.

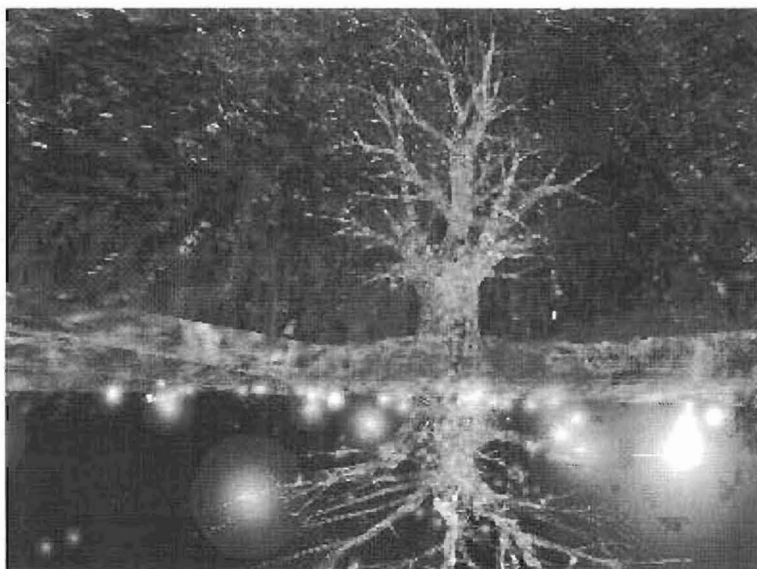


Fig. 2-2
 'Tree and Clearing' in OSMOSE®
<http://www.softimage.com/projects/osmose>
 OSMOSE®: Author Char Davies
 © (1995) Softimage Inc. All rights reserved.

'Following' OSMOSE® meant 'travelling' to sites such as art galleries and museums, where such interactive works of art are shown. It meant exploring the contexts of gallery spaces, the collections of works alongside which it was

shown, and talking to the curators of the shows. It involved considering the dynamics between private sponsorship and the production and display of art works, as well as how a skills base is organised amongst museum workers in high technology works. Along the way I encountered other important immersive works of art, including 'Placeholder', produced by Brenda Laurel and Rachel Strickland, co-produced by, and shown at, the Banff Centre for the Arts in Banff, Canada.

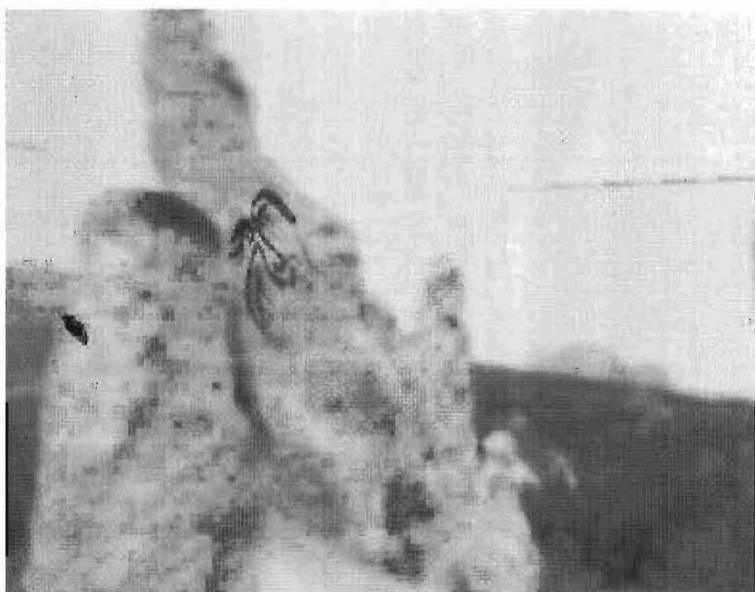


Fig. 2-3
 'The Hoodoos' – Rock Formations
 near Banff, with participant figure
[http:// www. interval. com/ projects/ placeholder](http://www.interval.com/projects/placeholder)
 Authors Brenda Laurel and Rachel Strickland
 © Interval Corporation

Another world of 'art' I briefly encountered was that of 'Detour: Brain Deconstruction Ahead', conceived by Rita Addison and produced by the University of Chicago in a 'VR Room' (and so was non-immersive). 'Detour' was produced voluntarily, by alliance made at an informal level.

'Garage' virtual reality is a descriptive phrase that describes a set of component technologies made by 'hobbyists', and are so diffuse and malleable they emerge in a number of different forms in different contexts, and are made by a number of people. The worlds I encountered when exploring 'Garage' technologies included a world of multi-dimensional stairs (based on the art work of Mauritus Cornelis Escher), and a family home. 'Garage' VR is a category in which the boundaries swing wildly; such 'systems' cannot be defined through reference to any particular artefact or virtual world. Their

component technologies can consist of a hardware system (such as an exercise machine, a personal computer and a television set) with software, put together by one individual, to 'shareware' projects in which a number of individuals contribute small pieces of code, a baseball hat 'tracker' or audio equipment (see Fig. 2-4).

In following these objects I connected with informal community of special interest groups such as VeRgE (Virtual Reality in Education) and VRASP (Virtual Reality Association of Students and Professionals).



Fig. 2-4
'Garage' VR equipment
Jacobson (1994), p. 94
© Linda Jacobson

These groups are purely voluntary associations, are organised by volunteers out of interest, and meet sporadically to talk about VR — whether to discuss the philosophical implications of 'avatars' (digital bodies — see Chapter Three), or swap code to 'hack' a Nintendo® Powerglove™ (see Chapter Eight for the creative use by 'garage' enthusiasts of various hardware objects). These special interest groups were only one example of mapping connections by means of following groups of *people*.

Following People

The object/ technologies which generate virtual experiences, and the struggles around them, are produced, maintained and resisted — *located* — in shifting material and symbolic exchanges amongst groups of people. Following *people* in communities which cohere around virtual reality technologies was one means to identify connections across different places and social worlds. Individuals, and their connections with other individuals and groups form networks of relation and social organisation in which technologies are embedded. Different social histories and biographies are brought to encounters with virtual systems. Technologies are made and used by different people, with a range of economic and cultural interests, who will make multiple and shifting alliance amongst themselves as those interests change across time, space and in different contexts.

As technologies, virtual systems are comprised of sets of social organisation, which include ways of making and using virtual systems. Participants form associations and social groups, they meet, they talk, they share technical advice, they hold positions in organisations which make objects and/ or tell stories and share knowledge, they construct a range of activities possible for their bodies, as well as systems of economic and symbolic value. Following groups of people who are associated with virtual reality technologies involves traversing a number of sites. Informal networks of association are as likely to cohere around the aforementioned ‘special interest groups’ as they are institutions such as universities.

Trade shows were not only opportunities to meet with a range of people from ‘garage’ enthusiasts to industry professionals, university researchers, and industry media. I attended conferences such as VRAIS (Virtual Reality Annual International Symposium), and the Computer Game Developers Conference in Santa Clara, California. I listened to visiting lecturers from university research labs, and spent time at the University of California at Berkeley’s Computer Science department with a programmer working there on virtual reality applications. From the connections I established through conferences and trade shows I talked to VR media — most notably *Cyberedge Journal* (see Fig. 2-5) — about their role in the industry.



Fig. 2-5

Cyberedge Journal
 Cyberedge Journal is a registered trademark
 Of Cyberedge Information Services Inc.
 Used with permission

In following garage objects, I spent a lot of time in people's living rooms in front of their computers, as well as their backyards, their verandahs or anywhere else they had decided to work on their computers. At other times, I followed them around trade show halls, trying on the gear they recommended and listening to why a twenty dollar 'hacked' substitute for the corporate product would do just as well. I visited virtual sites of social interaction — bulletin boards where code was swapped, hints on tracking shared, or websites where links to information and communal resources were located. Some of these bulletin boards and websites were maintained by individuals, others were those of professional or interest associations.

All these actions and interactions form bonds between individuals and groups which give technical systems their social 'environments'.¹³ Those interested in and working with virtual reality include computer scientists and engineers who work to build virtual realities, artists, graphic designers and marketing personnel. It includes hobby computer experimenters, or those who distribute the technologies to public consumers in a range of industry. It can also include journalists, cultural critics and sociologists. At different times I spoke to a number of these people in different sites, and followed them across their social connections to different locales. Doing so gave me an opportunity to identify the ways they formed (shifting) collectivities.

Following economic activity, as well as social bonds, is an important means of tracing circulation, exchange and interaction amongst people in VR worlds. Shifting markets of capital, labour and consumption cohere around networks of people. Skills and knowledge, as well as value, is circulated. In this regard I talked to companies about their business/ organisational and management concerns, both in the field of entertainment distribution (such as property developers who build theme parks, like Pacific Development and Investment Corporation in New Zealand, and entertainment franchising operations), as well as in the field of technology manufacture (as in the case of Virtuality® Ltd.). These connections touch on the dynamics of

professionalisation amongst groups of producers, as well as the concerns of business and corporate organisation.

This field of people who carry out activities around virtual reality technologies (and write about them) produce fields of competing ideas, meanings and practices about what virtual reality technologies are, the kinds of simulated worlds they generate, and their role in contemporary social life. As a consequence they add to the exchange of *stories* about the virtual which circulate in symbolic economies.

Following Narratives and Stories

As Morse (1997: 4-5) notes, storytelling plays a fundamental role in cultural maintenance, and modes of narration can be conceptualised as phases of enculturation which progressively embody a narrated 'I' in the body of the narrator, hence constructing 'subjectivity'. Such is the case with the processes of 'becoming virtual', and the cultural stories told about 'the virtual' play an integrative role in response to the material and symbolic challenges presented by virtual systems.

I was interested in understanding the *stories* I heard about virtual reality technologies as I encountered different people, objects media and texts in the field of VR.¹⁴ Some of these stories were about 'the virtual' at its most abstract and generalised level, and I was interested in how 'the [generalised] virtual' comes to be culturally articulated and defined, how it becomes embedded in and describes a 'New World Order' (Haraway, 1997). At the same time, I was interested in local stories about concrete systems — the stories that were told about the relations and processes of specific virtual systems, and the relation of those systems to larger narratives of the relationship between 'humanity', 'technology', 'nature' and 'society'. The process of following narratives and stories draws attention to the central place of the symbolic and representational in constructing social and cultural worlds.

As I followed stories about virtual systems across dispersed sites, their rearticulation in a number of different forms pointed to their commonalities (Ransom, 1993), and thus the transmission of cultural forms through discursive maintenance. That is, multiple stories across sites began to map 'discourses' of the virtual — 'ways of constituting knowledge [of the virtual], together with the social practices, forms of subjectivity and power relations

which inhere in such knowledges and the relations between them' (Weedon, 1987: 108).

The story of bodily transcendence through virtual systems is one widespread and powerful (because highly publicised) story that has been articulated in response to various category disruptions prompted by virtual systems. A literary genre called 'cyberpunk' articulates such a story, and finds supporters amongst communication and social theorists and philosophers (see, for example, Heim, 1993; Biocca, 1992; Benedikt, 1991). While not a coherent 'movement' per se, these approaches share a concern to map and predict a new era of 'the human' in which boundaries of many kinds between humanity and technologies are thoroughly deconstructed.

'Cyberpunks' of various sorts are enthusiastic about the modes of (technologically defined) embodied experiences that become possible through computer systems such as virtual realities. New media and communications technologies are said in these stories to institute communication and experiences previously unavailable, thus prompting the dawn of a new and more extensively technologically mediated age. R. U. Sirius, for example, argues in *Mondo 2000* (1992: 254) that

[u]ltimately, what's far out about VR is that it will let people better share the contents of their minds. With every possible kind of visual image and sound digitally stored, and with the ability to put that into motion, you could beam your dream or your vision, however strange, surrealistic or PERVERSE, right into the eyestalks of your virtual friend or enemy.

As Marvin (1988) notes, in her historical study of the development and diffusion of electricity, claims-making for new technologies attributes qualities and abilities to technologies well beyond their use value or performance. 'Cyberpunks' respond to the development of virtual technologies by talking about change in modes and meanings of human embodiment through the creation of virtual realities — changes in human perception, changes in means of communicating with others, changes in the way humans could experience the material matter (and imaginary) of the worlds around them.

While these claims might identify how technology creates new spaces for the negotiation of new human relationships with and through technologies, such claims are discursively articulated: positioned with and connected to already institutionalised understandings of and knowledges about human needs, wants and desires for the technical as they are attached to technical

practices. In cyberpunk stories, the development of virtual systems as a cultural tool is held to be the result of technical ‘progress’, a concentration or crystallisation of technical expertise through which ‘nature’ and ‘the animal’ is ‘tamed’, and such progress is held to be self evident in the form of the technologies themselves (Bukatman, 1995; Penley and Ross, 1991). ‘Technology-as-progress’ is an overwhelmingly dominant interpretation and rationale for technical development — a modernist story about humanity (Terry and Calvert, 1997: 2) which breeds a sometimes unexamined technological determinism (Grint and Woolgar, 1995).¹⁵ In the case of virtual reality technologies, for example, Jaron Lanier (1992: 70) claims that

we’re talking about something that has no purpose, or rather, it defines its own purpose. It’s very much like today’s technological advancement, which has no purpose in particular at this point, since our only true threats are diseases and natural disaster. All the other ones are optional developments ... [T]he other thing is that cultural change is very, very slow while technological change is very fast. You have to be careful not to confuse flashy, trendy culture with deep culture ... Things like language change very slowly. This has been one of the basic problems of our culture. Culturally, we are not ready for the technology we have...

‘Cyberpunk’ is an extension and *countercultural* articulation of these primarily ‘instrumental’ and positivist approaches to virtual reality technologies as computer tools — the computer science approach to virtual reality technologies as tools for the graphics industry, for training and marketing ‘applications’, for visualisation and work.¹⁶

The discourse of technological ‘progress’ is, in turn, tied through the instrumentality of prosthetic tool use to changes in modes of embodiment. One of the most powerful discourses circulating about VR is about the ways in which virtual reality technologies enable bodily and subjective ‘transcendence’ in the ‘cyberspaces’ (digital spaces) produced by virtual reality technologies (see Fig. 2-6 for the consensual and networked ‘cyberspace’ depicted in the film *Johnny Mnemonic*). This story is embedded in a whole set of binary categories which encompass, categorise and define differences in embodied experiences. ‘Transcendence’ describes an idealised mind state in which the (opposite and immanent) material matter of the body is suppressed, and devalued as an inferior state of being (Gatens, 1988, 1996; Butler, 1993). Having had a long history in Cartesian thinking, the mind/body split, established in the same ‘enlightened’ modernity which produced narratives of technical progress, is central to the notion of a digital transcendence.

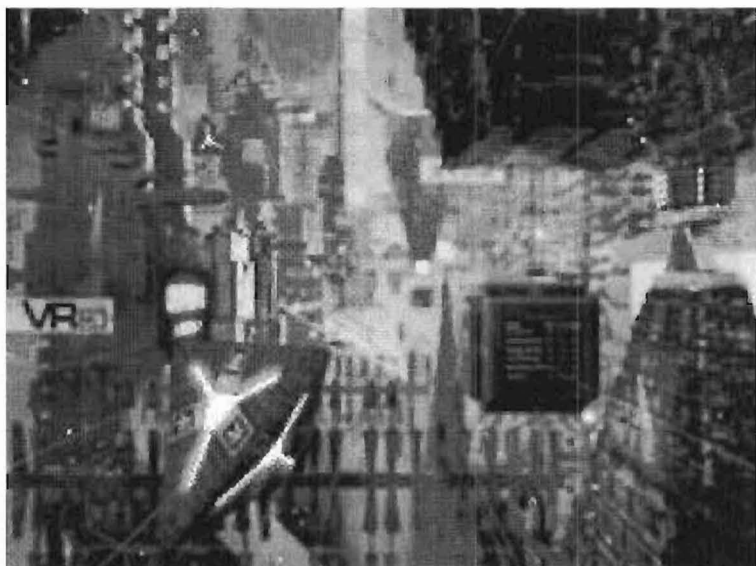


Fig. 2-6
 'Cyberspace' in *Johnny Mnemonic*
<http://www.spe.sony.com/movies/johnnymnemonic>
 © Sony Pictures Entertainment Imageworks

The terms transcendence/ immanence proliferate into other sets of oppositional categories: culture/ nature, future/ past, rational / irrational, reality/ unreality. In virtual reality technologies, the relational meanings around transcendence, mind, rationality and control construct boundary stories, which trace a desire for a shift in the 'limits' imposed by embodiment. These 'limits' are purportedly those of space and time, of perception, memory and reciprocity, all of which contribute to the relational, ongoing construction of social experiences (see Chapter Three).

This story of bodily transcendence is articulated in a number of ways, in a range of different social sites. On the one hand, science fictional accounts of cyberspaces and virtual realities in novels and films — such as William Gibson's (1986) *Neuromancer* and (1993) *Johnny Mnemonic*, Neal Stephenson's (1993) *Snow Crash*, Pat Cadigan's (1991) *Synners*, the popular films *The Lawnmower Man* (1992), *Strange Days* (1997) or *Circuitry Man* (1990), as well as the documentary *Cyberpunk* — provide dystopian visions of near futures in which organic bodies are 'retooled' with mechanical and digital prosthetics/ implants. Future fictions give way to present fictions in magazines such as *Mondo 2000* (see Fig. 2-7) and *Wired* (see Fig. 2-8), which celebrate digitally created worlds, virtual communities, nanotechnology, surgical and neurological implants/ prosthetics (as well as

cosmetic surgery), 'hacking' and 'phreaking', smart drugs, genetic alteration, and technological 'enhancement' in general.

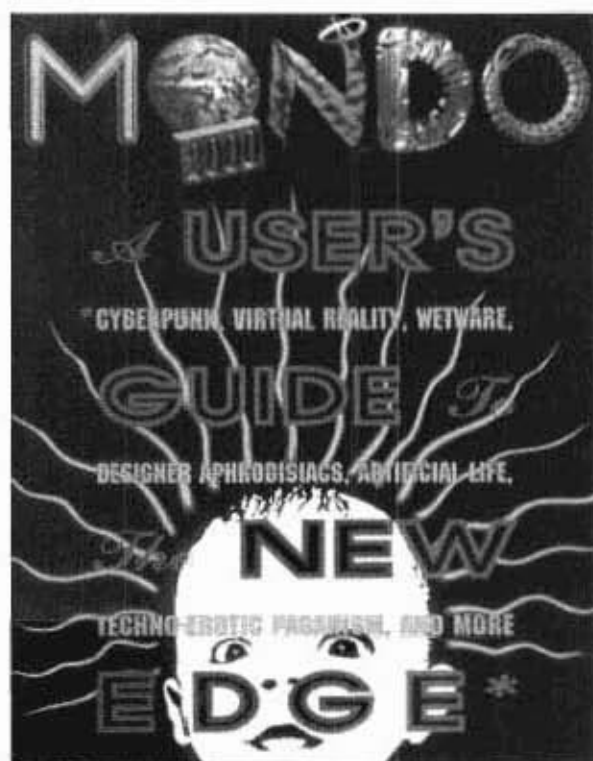


Fig. 2-7
Mondo 2000 User's Guide (1992)
 © Courtesy of Mondo 2000

The colonising and transcendental qualities of cyberpunk narratives about virtual reality technologies have been criticised as masculinist fantasies by a number of authors (see, for example, Springer, 1996; Balsamo, 1993; Fuchs, 1993; Ross, 1991; Pfeil, 1990. See Chapter Three for a comprehensive discussion of these arguments).

One response to cyberpunk has been to point to the qualitative attributes of such spaces and technologies, and reposition them as feminine — and potentially feminist — technical and cultural moments. Sadie Plant is one 'cyberfeminist' who draws on the imagery of 'the matrix' (from the latin root mater/ mother) to respond to some of the masculinist visions of cyberpunk. In doing so however, she draws on essentialist notions of 'Woman' (and 'Man') to link women with information and communications technologies (Wise, 1996). Plant (1996) remains caught in tropes around escapes from the body.

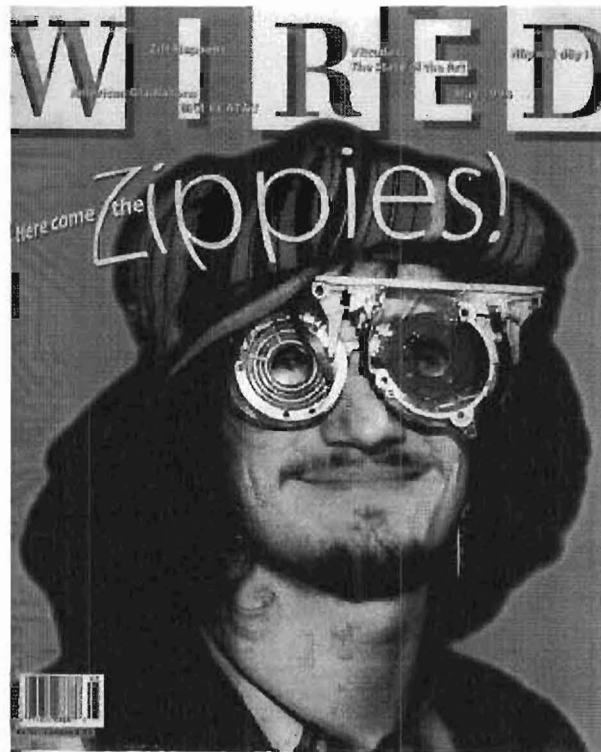


Fig. 2-8

Wired (1994)

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At least one of Plant's (1996: 37-38) interventions is worth quoting at length here:

Feminisations
Reflections on Women and Virtual Reality

the clitoris is a direct line to the matrix—VNS Matrix

Women, he has always said,
are tied to the earth
and too tangled up
with all its messy cycles and flows.

And yet on another invisible hand, women are too artificial for man: a matter of glamour, illusion, a trick. Even her foundations are cosmetic: she's made up. Hardly a problem out on the Net, where nature and artifice melt as they meet. No wonder women so quickly become advanced and fearless practitioners of virtual engineering.

Masculine identity has everything to lose from this new technics. The sperm count falls as the replicants stir and the meat learns how to learn for itself.

Cybernetics is feminisation. When intelligent space emerges alongside the history of women's liberation, no one is responsible. That's the point, the fold

in the map, where architects get lost in the pattern. Self-guiding systems were not in the plan.

Trace the emergence of cyberspace: through the history of commerce to the point at which capitalism begins to come out as a self-organizing system; through the history of mediation to the moment of immersion. War is of course the exemplary case: the theatre itself becomes cyberspace.

The construct cunt activates the program. Viral transmissions appear on the screen. Downloaded images converge with their own engineering. Markets and media; military machines. Intended to serve man's quest for planetary domination and escape from the corruptions of the troublesome meat, the matrix was always having him on. He gets the picture as it gets in touch.

All that matters turns itself on. Nature has never been waiting for man. Matter is microprocessing: what else do molecules do with themselves? There is no need to soften the edges of the virtual world. The matrix has in any case hacked into all self-conscious attempts to shape it in man's image of nature and artifice.

Travelers always leave their mark, and what is traversed marks them, out in turn. Humanity does not escape its own reprocessings. The technoscapes are trailers for future decompositions of the spectacle. Produced in their own machine codes where zero has long interrupted square one, these trips are as deliciously alien as their own fractal fabrications.

NATURALLY ENOUGH, OUTLAW ZONES
ARE COMING

AUTOMATICALLY.

Like cyberpunk accounts, Plant's reflections on virtual reality are highly abstracted from social practice, and (variously) speculative. While I'm all for letting the imagination run (critically) playfully wild, such speculation sometimes overshadows the very real sociological need to address what people *do* to construct the virtual in social life, rather than what people *might* do, or what forms technology *might* take in the future.¹⁷ Such speculation constructs a species of 'futurism' (for collections which evoke a 'futurist' framework see Benedikt, 1991; Helsel and Roth, 1991) common in corporate involvement in information and communications technologies, as it creates markets for such products (see Chapter Seven).

The analytical chapters of the thesis detail how these stories are related to common discourses, across sites, about identity, difference and embodiment based on binary/ dichotomous oppositions. Both within cases and between them, dominant meanings and practices act to categorise and differentiate bodies and selves in the production and consumption of virtual reality technologies. Dominant meanings of bodies and the role of VR technologies in forming them, are formulated, articulated and strategically deployed in daily

(oral, textual, semiotic and physical) interaction.¹⁸ Such discourses are identifiable through discourse analysis and semiotic methods which focus on the production of (often binary) categories of meaning which constitute identity and difference in both language and narrative (see Methodological Section).

The discourses of identity, difference and embodiment are articulated through relatively secure institutionalised locations not limited to the technical (see, for example de Lauretis, 1987; Grosz, 1994), but are made even more powerful through their association with science and technology as dominant and legitimate forms of knowledge about the world. As Avital Ronell remarks, VR ‘is system-dependent on classical tropes of representation, imagination, the sovereign subject, and negated otherness ... [m]ight as well face it: there has always been a desire to transcend the body, and I have often said I would donate my own body to science fiction’ (1996: 119).

At the same time, the cases illustrate the sometimes precariousness of dominant versions of social organisation. Fields of *competing* discourses — forms of knowledge, objects, persons, bodies — about virtual experiences are apparent in contemporary social life. Gendered and raced categories of persons are produced and regulated in sometimes contradictory ways through the stories produced about virtual reality technologies. Social subjects position themselves in relation to dominant stories, and use competing stories in moments of resistance (see Chapters Three and Five). Identifying these stories, and following them across sites, connected discourses with local material practices in networks of social relations. The discourses so identified included those briefly discussed here, and explored throughout the thesis — technology as ‘progress’, technology as prosthetic, cyberspaces as transcendental, cyberspaces as universal, individual freedoms and transparent communication — and the local practices which deploy these discourses constitute *social worlds* of various sorts.

Social Worlds

The networks which are formed in the process of crafting virtual systems are therefore embedded in multiple social worlds: not only the social worlds of computing and information technologies — of computer science and engineering — but also social worlds of business, of entertainment, of art, of hobbyist communities, of relations established through new communications

technologies. At Virtuality®, for example, the hardware and software development, initially technical in focus, also entails the process of building a business organisation. While the concepts for the hardware have had a long history and was embedded in the worlds of engineering and computer science, the formulas for what kinds of worlds were built come from the worlds of entertainment, and how to craft a capital intensive business in the entertainment world. These cases, then, point not only to bounded sites, but also to how alliances amongst worlds of technology, of business, of art, of entertainment, of communities of interest, of corporate/ government/ university are made. These alliances contribute to the possibilities and constraints associated with ‘becoming virtual’.

What is interesting about these objects, people, stories and the connections between them, is that they demonstrate the heterogeneity of both virtual reality technologies and embodied experiences of them, and point to some of the ways that power relations are actualised in technically intensive social sites. The cases draw out *competing* discourses and practices about what virtual reality technologies are, how humans interact with them, and the challenges they pose to the boundaries of bodies and ‘realities’. In multiple ways, mapping the connections between these cases charts how discourses of virtual personhood and subjectivity cohere with disciplines of the body in virtual reality technologies, and the competing versions of ‘becoming virtual’ that become available in different contexts.

Stories III: A Brief Return to Biopolitics

Technologies only make sense in so far as we can say people do something with them (Wajcman, 1994). Virtual systems are therefore created according to a conception of the human, their/ our abilities, dispositions, desires. The ongoing questions I had as I followed stories, people and objects focussed on the connections between people and their artefacts, and the connections across a number of economic, technical and cultural worlds. What elements of virtual technologies contribute to a sense of embodiment and subjectivity as ‘virtual’? What social worlds frame, enable and produce experiences of the virtual? Who inhabits these social worlds? How can virtual experiences be traced to technological development, production and deployment? What kinds of constraints and possibilities for ‘becoming virtual’ are presented by

the connections between human bodies and immersive virtual reality technologies?

This cluster of questions speaks to the way ‘the virtual’ is deployed at the centre of a number of contemporary sociological concerns. These concerns include the transformation of social, economic and cultural life around information, communication and computing technologies — including the transformation of time and space (local/ global dynamics) (Webster, 1995), of systems of economic exchange (Gibson-Graham, 1996), and of the organisation of nation-states (Kahin and Neeson, 1997; Loader, 1997). These dynamics have prompted a reconsideration and of long standing issues around the formation of subjectivity and embodiment with respect to technology, and the reworking of loci of power into new forms, even as ‘older’ power relations are reconfigured anew.

I have, like Penley and Ross (1991: xii) become ‘[w]ary, on the one hand, of the disempowering habit of demonizing technology as a satanic mill of domination , and weary, on the other, of postmodernist celebrations of the technological sublime ...’ Rather, I am interested in approaches which define technology in relational terms such as that of Rammert (1997: 176):

as a particular social process of relating things, signs, and humans in order to cause controlled results ... *Techno-structuration* takes place when the heterogeneous elements of these technicization processes [‘establishing effective schemata as tools of practice with an end-in-view’] are coupled and transformed into artificial and relatively closed systems in a manner which allows the intended effects to be expected with high reliability ... We usually speak of a functioning technology when the heterogeneous elements are closely coupled and interact according to the rules.

Such an approach stresses heterogeneity in technical systems (including the organisations that produce and distribute VR and make consumption possible), and also suggests that ruptures in ‘coupling’ are possible. The question of power, as a quality a person or group possesses, is transformed into questions of power as networks of relation. The focus moves from deciding whether individuals find controls and freedoms of various sorts in virtual worlds (or whether those who use them are controlled by the parameters of the worlds that have been constructed for them), to how signs and practices, texts and bodies are negotiated in material and discursive practices of making and using virtual reality technologies.

Donna Haraway’s famous ‘*A Manifesto for Cyborgs*’ (1990) is pertinent here, as it attempts to reformulate a political myth to address the collapse of

boundaries between the natural, the technical and the socio-cultural. In Haraway's story, the figure of the cyborg is metaphorically/ literally invoked to stand in for shifting political alliances across boundaries. The categories of the 'natural' and the 'technological' are not pure, and social life — including the processes which comprise gendered embodiment and subjectivity — are messy, borderland procedures. In the context of political relations of domination and resistance, cyborg bodies can both maintain cultural assumptions about gendered bodies in certain ways, but they can simultaneously deconstruct cultural assumptions about bodily boundaries, the relationship between the technological and the organic, and also the meanings associated with the cultural markers of the 'Other': a reworking of and challenge to the signifiers of gender, race and ability in contemporary western culture (Star, 1991).

From this analysis I take a conceptualisation of virtual bodies as cyborg bodies, simultaneously occupying both physical space and the spaces of information, hybrids of both the organic and the machine. This conceptualisation focusses on connections rather than 'bounded' 'objects' of study, and points of contradiction and rupture rather than continuities across systems. This analysis stresses heterogeneity (Law, 1987), the dissolution of boundaries, the symmetry of analytical categories (Latour, 1987), and the role of power across networks of social relation.

N. Katherine Hayles (1996) reworks some of the questions asked of such technologies to focus on the *connections* between virtual reality technology, its production, and embodiment in virtual space. Anne Balsamo (1996) extends consideration of these issues to embed the links between the production and consumption of immersive virtual reality technologies with the wider cultural and economic milieux in which these social relations are embedded. In each case, the focus is on the complex, concrete and uneven process of constructing 'virtual' social relations. Against the background of reconceptualising contemporary socio-technical relations, Markley (1996) and Kendrick (1996) have also reiterated the fundamental importance of investigating the concrete, the local, the contingent, and the organisational dynamics of artefact production in virtual reality technologies.

Discourses about virtual experiences are at their most powerful when they draw on already powerful and institutionalised belief systems, and when they play on *desire*. In the following chapters I draw on notions of discipline and the self regulation of social subjects. The attachment of bodies to desires through disciplinary micro techniques which structure identity and

difference is a significant dynamic in regulation and discipline (Sawicki, 1991). Such discourses and disciplines are embedded in interactional contexts, in networks of relations; the politics of virtual systems are embedded in already existing networks of power, while also configuring opportunities for new controls and regulations, and resistances to them. In arcades and leisure centres, for example, this includes a politics of capital and business (resources, access, profit), but is also the politics of technical know-how (knowledge and access to it in professional communities), as well as the politics of culture and locality in the interpretation of digital worlds and embodiment in them. Alternatively, 'garage' organisation involves the politics of community, the negotiation of local informal and interpersonal networks, of the 'freedom' or privilege to talk and think about the philosophy of virtual realities at a 'grass roots' level.

The 'cases' employed throughout the thesis therefore seek to illustrate heterogeneity and points of rupture in the ways that technical systems are created, taken up and used in different contexts. This is a concern about the control and regulation of technical access, organisation and control. Who has power with respect to virtual systems as technical systems? Who defines what virtual systems will be, where and how? The thesis also seeks to describe, map, construct a framework to understand the micro-political work done through VR. Mapping the networks of power which construct technologies, worlds and experiences is inevitably political. It indicates that what 'the virtual' is, and how it is counted as such, are never obvious but rather contested in their effects. What is at issue here is how virtual systems figure a politics of subjectivity and embodiment. How does 'the virtual' become defined, how does 'the human' become defined in relation to 'the virtual', and how are these concepts articulated and reworked across the production, distribution and consumption of virtual systems? What humans are defined through virtual systems? Who are they, and what relation do they bear to 'us'?

This contestation and negotiation opens spaces for shifts in power, knowledge and technics. What possibilities exist for widening definitions of connection, of equity, of identity? Is it possible to rethink communities and the cultures we live in through information and communications technologies such as virtual reality systems? The embodiment of the human as mediated by digital worlds is at issue here, as are questions of identity, difference and meaning in those digital worlds. It is to these concerns, and the analytical challenges presented by them, that I now want to turn.

Section Two

Experiencing the Virtual

Introduction

[T]echnology, science, culture. These categories have lost their disciplinary and ontological integrity since, in the realm of experience and ontology, each of them is permeated and penetrated by the other two.

Menser and Aronowitz *Technoscience and Cyberculture*

'You remember I asked about ghosts on the net? I see the life there, but I cannot *feel* it, which makes me uneasy in spirit. It is hard to explain.' ...

Renie had been a net habitué for so long that she sometimes did indeed think of it as a place, a huge place, but just as geographically real as Europe or Australia. But !Xabbu was right — it wasn't. It was an agreement, something people pretended was real. In some ways, it *was* a country of ghosts ... but all the ghosts were haunting each other.

Tad Williams *Otherland*

When I first began investigating virtual reality technologies, my attention was captured by the extent to which virtual worlds problematised boundaries of various sorts. Boundaries between 'self' and 'other', 'body' and 'apparatus', 'reality' and 'unreality', 'organic' and 'digital' were all troubled in various ways

by the emergence of virtual reality technologies. The degree to which popular and academic debate about virtual worlds or cyberspaces (the three dimensional digital spaces created by computer software) centred on these problematic boundary crossings — whether to celebrate or vilify them — was, I thought, indicative of the degree to which those categories seemed to be contestable.

The challenge to binary categories in the practice of everyday life is certainly not new. Technologies have always been a site where such categorical markers of identity and difference have been contested (Stone, 1996; Penley and Ross, 1991). It seems that the notion of ‘experience’ in particular is central in such struggles in virtual reality technologies. Everywhere in media, in popular culture, in everyday life, there is evidence that information, computing and communications technologies have become central in struggles over ‘experience’ in a politics of subjectivity and embodiment. As Kendrick (1996: 144) notes, ‘[t]he making of subjectivity ... is not a metaphor; construction requires tools, and technology, in innumerable local ways, provides the tools that aid in constantly reconstructing notions of identity that are always and already marked by radical interventions.’ The questions in which I was interested were therefore common in other fields of social enquiry, including the way feminist, cultural, science and technology studies analysed information and new communications technologies. What kinds of social experiences were made available through virtual reality technologies? What digital worlds were created by these technologies? What kinds of persons, bodies and identities are produced through participating in those worlds? How was the production of those bodies and identities achieved? How do these persons and bodies rework categories of identity and difference? What does this mean for a politics of subjectivity in the sphere of communications technologies? Whose bodies are struggled over, and how, in reconfiguring categories of self and embodiment?

When I began this project, what did seem to be unusual in the case of virtual reality technologies was that social theories about ‘becoming virtual’ were not accompanied by, nor grounded in, studies of *what people did* when they participated in virtual reality technologies. Much of the emerging analysis centred around virtual worlds as ‘texts’, or the textual treatment of media-sourced pronouncements from the ‘experts’, while neglecting to address how the meanings or discourses therein are variously and unevenly ‘taken up’ in different social worlds. My interest was to complement my own cultural and theoretical

readings of virtual worlds as ‘texts’ with accounts of virtual experiences: to understand how participants experience virtual worlds and the technologies that generate them from the point of view of those who became/ become virtual in various ways. I was most interested in talking to people about how they deciphered, interpreted and lived digital worlds while they were ‘in’ it. I developed a multiple methodological strategy (discussed in the Methodological Section) which generated a number of ethnographic stories to run up against the academic and popular resources I had already explored.

My intention was not to treat these ethnographic stories as a ground for ‘truth claims’. My familiarity with feminist analyses of subjectivity which deconstruct the notion of ‘experience’ as originary precludes such a project. Rather, experiences can be conceptualised as processes ‘by which, for all social beings, subjectivity is constructed. Through these processes one places oneself or is placed in a social reality, and so perceives and comprehends as subjective (referring to, even originating in oneself) those relations — material, economic, and interpersonal — which are in fact social and, in a larger perspective, historical’ (de Lauretis, 1984: 159; see also Scott, 1992). Virtual experiences are therefore the ways that virtual subjectivities are *constructed*.

‘Experiences’ are crucially material, and continuous reconstructions of our selves are achieved throughout ‘everyday life’ — in ‘habitus’ and discourse. For Bourdieu (1977: 56), ‘habitus’ is ‘embodied history, internalized as a second nature and so forgotten as history — [it] is the active presence of the whole past of which it is a product.’ Subjectivity is not a pre-given or fixed state from which one interacts with a separate and objective world, nor is it simply a singular effect of ‘external’ forces upon individuals which defines a personal essence. Rather, subjectivity, our ways of understanding ourselves and our relation to our social worlds, is an ongoing creation (Weedon, 1987). Experiences are the multiple effects of subjective *performance*, in which individuals engage in the practices which give significance (value, meaning and affect) to the social world. Performances within virtual realities are just such significant practices, and the collective performance of virtual embodiments and subjectivities potentially institutionalises their effects. At the same time, experiences are also an intervention in the world, as seeing or doing something is not simply a process of reflecting some pre-existing reality, but is a process of remaking the social world. Actions, stories and narratives do things in the world, and so experiences

are collectively and inter-subjectively realised. 'Experience in this definition ... becomes ... that which we seek to explain, that about which knowledge is produced' (Scott, 1992: 26), rather than a ground for truth claims. In constructing narratives to themselves and others about VR encounters, and in positioning multiple facets of themselves and their social worlds in relation to VR systems, individuals produce and are positioned through the experiences which they take as originating in themselves through their use of virtual reality technologies.

As I began to conduct interviews, my impression was that the experiences of those who participated in virtual reality technology were multiple. When people talked to me, they talked not only about the representation of their body in a virtual world, but also about whether they could see the sides of the screen or not. When people talked about their feelings and sensations, they talked about 'being there' as well as about 'disjunctures'. They talked about the speed of the graphics as well as about their multiple interpretations of particular digital worlds. These accounts underlined the notion that the construction of virtual experiences operated in at least two different ways simultaneously, both through technical interventions, interfaces, bio-apparatuses, as well as through semiotic, discursive, narrative practices.

Through this research I became convinced that virtual worlds, and the notions of self, body and reality which emerge from them, are more than cultural artefacts of sign and meaning. Virtual reality technologies are also more than simply instrumental tools, or objects. Social worlds and technologies are intimately bound together as complex socio-technical systems. What virtual worlds signify cannot therefore be dissociated from the subjective, embodied enactment of them. Moreover, enactments of the technologies are cultural moments in which both 'new' and 'old' social worlds are produced. Here, my epistemological and analytical questions are also political. My most pressing concerns have been to trace what kinds of bodies are produced through the ways that virtual realities rework bodily and subjective boundaries. What are the social and cultural implications of those reworkings?

These questions, emerging as they have from fieldwork, tend to challenge the various ways that digital worlds have been analysed textually: whether those analyses are cyberpunk, cyberfeminist or the work of critical theorists. This ethnographic challenge to the theoretical approaches I encountered increased

my conviction that the politics of subjectivity in virtual worlds could not be addressed analytically by reading virtual worlds as if their texts had one, transparent meaning. Nor could such microworlds, which included bodily action and interaction, be treated simply as texts. The enactment of VR both problematises self and embodiment, and renders problematic the ways self, body, world and technology were theorised in accounts of virtual realities. VR had to be treated as cultural, social and technical networks simultaneously. Where were 'reality', 'the virtual', 'self' and 'body' situated, and how could they be conceptualised in an analysis of virtual worlds?

The following chapters are my partial and provisional answers to such analytical dilemmas. For this section, I have taken the physical boundaries of the machine, and the network of connections between different virtual systems, as the 'site' of study (although, as we shall see, the boundaries of this site are porous). The connections that are the subject of my analysis here are the connections between participants, the digital texts which comprise virtual worlds, and the possibilities for action and interaction provided by the technical system, all of which construct 'experiences' of virtual worlds. My aim is to tease apart those connections as they pertain to a politics of subjectivity and embodiment. These chapters run theoretical stories, fictional stories and the stories of VR participants up against each other, and embed the connections between them in a wider network of links between different instances of technology, and a range of discourses about how technologies rework subjectivity and embodiment.

Across Chapters Three and Four, I have addressed a range of materials in multiple ways. On the one hand, treating virtual worlds as texts lends itself to semiotic, linguistic and discourse analysis, on the assumption that representations and the meanings they generate do political work within a culture to generate bodies, identities and differences. This analysis forms the basis of Chapter Three, and consists of my own theoretical and deconstructive reading of a variety of digital worlds. The chapter provides an elaboration and deconstruction of digital images and the languages which describe them. Through such categorisation, I am interested in identifying the basis for the 'regulation' of virtual embodiment, and potential resistance to it. My own account of virtual worlds constructed within the chapter is supplemented with others' readings, both analytic and ethnographic. These stories are embedded in

a consideration of the connections between stories in/ of immersive digital worlds, and the stories of fiction and film.

In Chapter Four, I expand my consideration of virtual worlds by reconsidering the role of technologies. This strategy addresses the role of VR ‘interfaces’ in constructing new kinds of boundaries, new kinds of bodies, new kinds of selves. This second mode/ aspect of analysing virtual experiences is to consider how representation articulates with a participant’s material placement in a bio-apparatus (Balsamo, 1996). This latter approach, derived from science and technology studies, lends itself to interactionist and phenomenological analyses which consider how bodies, the activities in which they engage, and the techniques to which they are subject, produce particular actions and behaviours. Thus the parameters for possible or desirable action are constructed, which inform the further development of technologies and the constraints they enact on processes of ‘becoming virtual’. I consider how the material form of the object enables or constrains particular kinds of activities, and consider how various bodily disciplines impinge on the construction of body and self.

Firstly, however, I want to turn to the digital worlds of fantasy and imagination I encountered when I first became virtual.

‘Reading’ the Virtual:

Worlds, Texts and the Politics of Subjectivity

The dream: to know a foreign (alien) language and yet not to understand it: to perceive the difference in it without that difference ever being recuperated by the superficial sociality of discourse, communication or vulgarity; to know, positively refracted in a new language, the impossibilities of our own; to learn the systematics of the inconceivable; to undo our own “reality” under the effect of other formulations, other syntaxes; to discover certain unsuspected positions of the subject in utterance, to displace the subject’s topology; in a word, to descend into the untranslatable...

Roland Barthes *Empire of Signs*

[t]hese ontologically confusing *bodies*, and the practices that produce specific embodiment, are what we have to address, not the false problem of *dis*embodiment. Whose and which bodies — human and non-human, silicon-based and carbon-based — are at stake and how, in our technoscientific dramas of origin? And what is the specific political and moral accountability attached to these not-always-human bodies?

Donna Haraway *The Virtual Speculum in the New World Order*

Virtual experiences of self and embodiment are situated in the midst of a profusion of popular representations and theoretical debates about contemporary technological practices. What is at issue in these debates are the interactions

between humans and computers, the status and importance of organic bodies in the information age, and the status of (gendered) human subjectivities in relation to technologies. What kinds of bodies, persons, identities are produced by participation in virtual worlds? What differences, categories, diversities are thereby generated?

Technically mediated experiences of the world are crucially concerned with embodiment. We are always embodied.¹ And yet as we have already seen in Chapter Two, many accounts of ‘immersive virtual realities’ represent those experiences as ‘disembodied’, where ‘presence’ is rendered as ‘immaterial’ information, becoming flexible and malleable as a result of digital signification practices. Virtual reality technologies are celebrated by some of their creators as potential levellers of prejudices based on gender, age, ethnicity and ability. Some even suggest that virtual realities might abolish language, sexual differentiation and even species difference. Jaron Lanier, for example, argues that ‘Virtual Reality is the Ultimate lack of race or class distinctions or any other form of pretense, since all form is variable’ (in Boddy, 1994: 118; see also Biocca and Lanier, 1992).

The pleasures of these interfaces, as Springer (1991) notes, are constructed through the rhetoric of a sublime and limitless possibility, of reworking self and identities, of being taken beyond the mundane. ‘Limitless’ digital spaces offer opportunities for colonisation, mastery and control over one’s environment, and therefore escape from the sometimes problematic and messy worlds in which ‘real life’ bodies operate. In short, digital subjects are said to be ‘free’, self-determining of the conditions of their own embodied being, and more powerful in contrast to the powerlessness they might experience in non-programmed spheres of their lives. When I first entered the field, these assumptions about ‘being digital’ were shared by emerging media depictions of bodies in cyberspaces, such as the film *The Lawnmower Man* (see Fig. 3-1).

These public stories of digital bodies influence how ‘virtual’ ways of being are created. If digital bodies are said to transcend the ‘limits’ of a physical embodiment (despite their patent material realities), then this has a material effect on the direction and development of immersive virtual reality technologies as physical artefacts (see Chapter Eight).

In this chapter, such discourses — and their limits — are a starting point for investigating how different configurations of signification and identification in

virtual worlds are struggles over the production of particular kinds of persons, bodies, experiences, and over the futures of virtual reality technologies.



Fig. 3-1
TheDigital Jobe
The Lawnmower Man
Mondo 2000 (1992) p. 258
Photo: Angel Studio
© Courtesy of Mondo 2000

Such stories attempt to create 'black boxes' (Latour, 1987) of virtual bodies and experiences, in which a series of symbolic and technical relationships are defined and rendered as conventional ways of reading and experiencing virtual worlds.

As Richards (1996) notes, the potential to disturb dominant notions of the 'self' and 'reality' are some of the most compelling potentials in virtual reality technologies. Immersive virtual realities create embodied experiences through an individual's connection with a digital world created by, and mediated through, computer technologies (see Chapter Four). By virtue of creating a culture of rules and simulations (Provenzo, 1991), virtual spaces become self-contained microworlds. These worlds are both 'imaginary' and 'real', full of the potential and excitement of alternative means of being embodied, and yet fraught with the problems and contradictions presented by power relations already embedded in the discourses and practices of information and communications technologies.

Berger and Luckmann (1966: 23) argue that '[e]veryday life is taken for granted as reality ...' by its participants, but that 'paramount reality' is unstable,

and punctuated by interruptions. Cohen and Taylor (1992: 112) argue that slippage into 'nonordinary states' can be accidental (such as falling asleep unexpectedly), or they can be deliberate escape attempts from everyday life in which

we want ... a flight to an area in which we can temporarily absent ourselves from paramount reality, find ourselves out of play, and assemble our identity in peace or with new and more powerful symbolic resources.

Virtual realities can be 'framed off' as different modalities of experience from 'paramount realities', and are made meaningful by drawing on multiple 'accents of reality' (Schutz, 1971). How much is invested in these different realities, and the degree to which they require the reworking of significant social identities and practices, constitute the struggles over 'reality', as well as over 'presence', which characterise participation in VR for many of the people I talked to.

This chapter therefore examines the lived, symbolic economies of virtual worlds, and the symbolic resources provided by digital worlds for the process of 'becoming virtual'. What symbolic resources make virtual self/ subject construction possible, and in what kinds of digital worlds? How is difference and diversity represented and enacted in such worlds? How do these symbolic resources problematise 'non-programmed' personhood, identity and embodiment? How do virtual reality technologies 'engage socially and culturally marked bodies?' (Balsamo, 1996: 125). How are such resources read by those that participate in them? Where in virtual worlds are markers of difference read, how does this position participants, and what/ whose identities and bodies are at stake in this process?

To examine these questions, I want to tell a number of theoretical, 'popular' and experiential stories about becoming virtual. In this sense, several social 'texts' — the images which comprise virtual worlds, advertising about them, interviews with participants in those worlds, fictional stories, and a number of theoretical accounts of social life and understandings of self and body — are read 'with and against' each other (Game, 1991).² Throughout this chapter, I want to address two techniques in particular — the symbolic work done through images as signs (representation/ simulation), and the various forms of narrative or storytelling in virtual worlds. In the first case, the presence of signification (and by implication, the absence of alternative signs) is at issue in examining different forms of inclusion and exclusion — or the imposition of difference and

boundaries — in virtual worlds. In the latter case of narrative, metaphors and scenarios, both the genres to which such worlds belong, and the ways their stories are told, are important to examine in exploring what kinds of imaginative resources are used to understand social relationships.

These stories are negotiated on the basis of a ‘pragmatic understanding which is based in the reflexive experience of everyday life’ (Gottdiener, 1995: 26). Investigating how virtual experiences are constructed from interpretive performances allows an exploration of the similarities and differences amongst worlds, and emphasises the numerous and unstable positions social subjects can create in relation to the virtual worlds and technologies in which they participate. The diversity allowed/ enabled in such representational categories, the desires and identities to which digital bodies are attached, and their implications for a politics of embodiment and subjectivity, are discussed throughout the chapter.

Exploring Virtual Worlds

I looked up at the sky which was rendered as a starry night sky. When I looked down, I could see my feet, and when I brought my hand up with the gun to wave it in front of my face, it all appeared in my vision — arm, hand, and gun clenched in my fist.

Fieldnotes Auckland 1995

So I think computers are really great ... for allowing us to do things that we can't ordinarily do ... I come to it ... with an artist's sensibility so I would love to have people experience stuff that they've never experienced before and maybe wouldn't be able to experience in their normal conditions or in normal states of mind.

Doug Faxon *Interview*

In virtual worlds, notions of being are constructed through the presence and absence of signifiers which describe and represent digital world spaces and bodies which inhabit them (Tenhaaf, 1996). Balsamo (1996: 131) argues that ‘[i]f we think of the body not as a product, but rather as a process—and embodiment as an effect — we can begin to ask questions about how the body is staged differently in different realities. Virtual environments offer a new arena for the staging of the body — what dramas will be played out in these virtual

worlds?’ How bodies are signified, and how they are placed amongst digital symbols which comprise a world, mark boundaries amongst categories of difference. What is represented (or not), and how it is represented (or not) in contemporary virtual worlds indicates the kinds of bodily attributes, subjectivities and ideological allegiances which become dominant in computer-mediated cultures.³

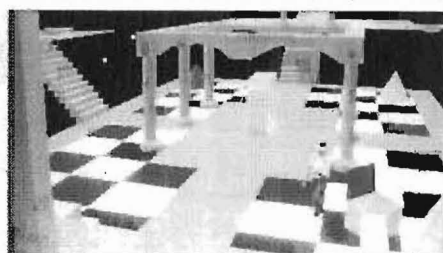
Powerful ideals about a body freed from physical constraints and constructed through the powers of imagination are represented and elaborated as subject positions in the practice of virtual embodiment. These stories are not new — historically, the production of new (commodified) technical forms employs discourses of ‘freedom’, choice and the sublime (Marvin, 1988). The notion of ‘presence’ expresses this digitally mediated and situated embodiment, and draws on a central ideal often repeated in discourses about immersive VR. This ideal is that of the transcendence of the physical body through the suppression of that body in the service of a digital body, constructed in a world through how digital bodies and a point of view are inscribed in a digital world.

Such notions of digital presence are explicitly written into the virtual worlds available for public consumption. Jon Waldern, the Chief Technology Officer at Virtuality® Ltd. talks about an ‘ideology of immersion’ (in Schroeder, 1996: 85). The virtual worlds produced by Virtuality® in their entertainment ventures are some of the most widely spread, publicly accessible, immersive virtual worlds. Of the numerous titles that Virtuality® had produced, the most popular game that I encountered in my reconnaissance of entertainment sites was Dactyl Nightmare™.⁴ Dactyl Nightmare runs through the Virtuality® Entertainment Ltd. Cyber CS1000™ unit⁵ described in Chapter Two. In Dactyl Nightmare™, the objective of the game is to score multiple ‘hits’ by ‘shooting’ other characters, thereby scoring as many points as possible. The participants play across a game board suspended in space (see Fig. 3-2). A recurrent threat is a Pterodactyl which attempts to pick up, and then drop (thereby ‘killing’) the players in the game.

The world comprises ‘chessboard’ spaces which provide the playing ground of the game (five fields, connected on two different levels via staircases), the building in the middle of the central playing space, various pillars which are scattered around the board, the large green pterodactyl flying around overhead, and the bodies of the players (an opponent can be randomly generated by the

computer, or can correspond to the action of another person if the game is networked) (see Fig. 3-3).

Dactyl Nightmare
(surreal hunt, and be hunted experience)



The World's first CyberSpace
 entertainment Experience is designed for
 one to four players. An ideal introduction
 to game-play with an easy to understand
 concept.

Players are plunged into an ultra-real
 setting trying to avoid the combined
 threat of giant sweeping pterodactyls plus
 other players in this game of
 unprecedented realism.

Fig. 3-2
 Dactyl Nightmare™ game space
 Virtuality (1993) p. 13
 © Virtuality® Ltd.

Three-dimensional sound plays throughout the game, a music score which I would compare most closely to 'elevator music', along with the sound effects of weapons, and the cries of the other characters or creatures in the game. This is how I first described the images in Dactyl Nightmare™ in my fieldnotes:

The initial scene was the spread of the game board seen from a disembodied position high above the stage ... I found myself standing in the centre of the playing field, looking at a structure which resembled a model of a Greek temple - four pillars with a roof at the top ... The setting of the space did look so much like a chess board ... and I'm sure it was no accident that I felt like a life-sized chess piece ... I saw my opponent from the corner of my eye, a movement beyond the pillars; he looked as chunky and squarish as I did (Fieldnotes, Auckland, January 1995).

A player is assigned a digital body in Virtuality® games, the shape and actions of which are constructed through spatial information from tracking devices

attached to the head and hand sets which a participant wears on her/ his body (see Chapter Four).

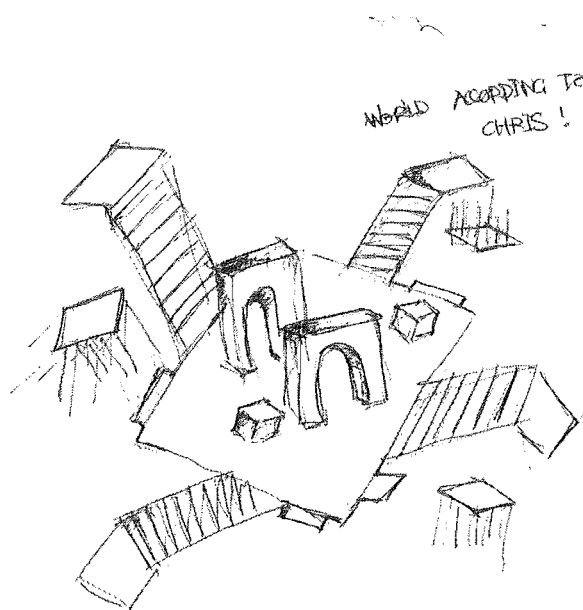


Fig. 3-3
One participant's drawing of the
Dactyl Nightmare™ Game Board

Only parts of these bodies can be seen by the participants themselves — those parts that would be seen when viewing one's physical body without the aid of a technology like a mirror. The 'puppet' digital body is attached to a 'point of view', or 'gaze'. The contours and surfaces of digital bodies, their boundary points, shape, textures, and behavioural attributes define a range of dominant meanings for a digital morphology. In Dactyl Nightmare™, the digitised bodies which all players are assigned take the form of a 'generic' human figure,⁶ a chunky body with squarish outlines of arms and legs, and represented as having blue legs, a white torso, and a dark upper head (culturally inscribed with jeans, T-shirt and short dark hair) (see Fig. 3-4 which depicts the bodies of Dactyl Nightmare 2™). One of the game players I talked to described this body as 'just a normal person'.

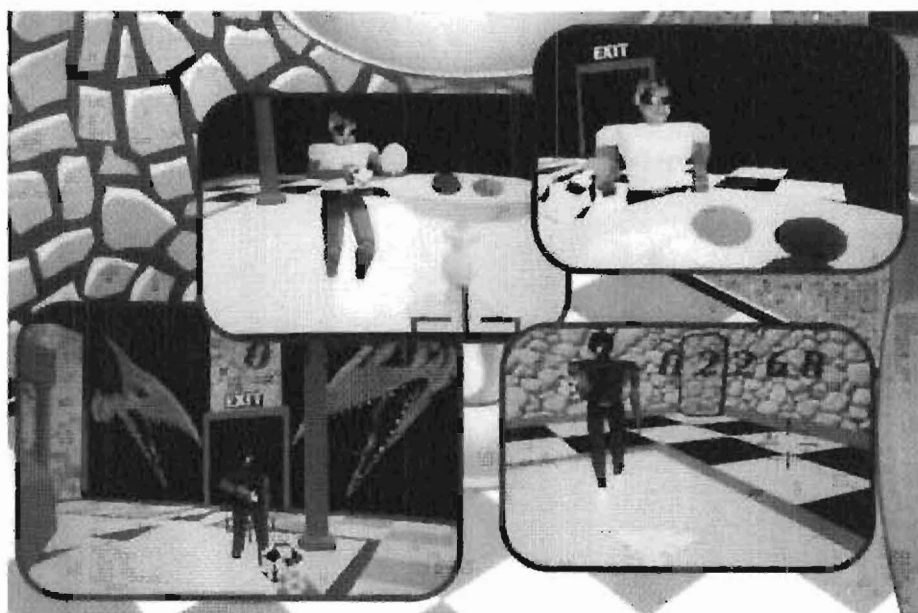


Fig. 3-4
The bodies of Dactyl Nightmare 2™
Dactyl Nightmare 2™ Advertising
© Virtuality® Ltd.

The bodies appear similar to the body in the program 'Jack',⁷ developed by Badler, Phillips and Webber, and shown in Fig. 3-5. In *Simulating Humans*, Badler et al. (1993) introduce and describe their particular graphics modeling and animation software systems for producing computer simulated human figures; a software program called 'Jack'.

Although the figure modeled in Jack is represented as 'human' by the accompanying text, the model appears significantly masculine, not only in physiological features which typify or represent the considered norm of masculine body shape, but also in the cultural indicators of gender with which the figure has been marked. The clothing, adornment/accessories, and hair, all denote the masculine figure. With reference to the figure, however, the researchers state that '[t]he standard or default body model in Jack ... has a reasonable shoulder/clavicle mass, has a full hand, and has a generic face. A hat is added to avoid modeling hairstyles' (Badler et al., 1993: 15).

The general shapes of the bodies here conform to an idea of an autonomous individual, bounded by skin, and differentiated from other bodies as objects — 'the body', the historically constructed western individualist subject, whom Grosz

(1994) suggests is an historical abstraction because it evokes sameness, similarity and continuity.



Fig. 3-5
'Jack'
Badler et. al. (1993) p. 10.

Since Descartes and *cogito ergo sum*, the ideal western subject is privileged by rational thought and consciousness. In virtual worlds, this notion of consciousness represented digitally is described by the term 'presence'. 'Presence' in a digital world also implies its opposite — 'absence' — from a material world (Hayles, 1993). 'Presence', and the digital, are hierarchically privileged. As Gibson-Graham (1996) notes, oppositional thinking is enacted relationally, always implying other privileged terms. The 'preferred reading' (Hall, 1980: 134) of embodiment in Virtuality® texts is a notion of 'pure' digital presence (which is also a pure transcendence of material embodiment), a presence in a digital world in which a material body is simultaneously suppressed/ erased and called into the service of a digital body in a digital world.

There are a range of ways that digital bodies code the material 'disembodiment' required for digital presence. They do so, for example, by virtue

of being digitally generated. The material form of these object-bodies is as layers of 'formalisation' from binary code to programming and graphics languages. Here, the central strategies carried out to create formal representations are 'abstracting (removing specific properties), quantifying, making hierarchies, classifying and standardising, and simplifying' (Star, 1995: 90). The 'disembodiment' of simplified and standardised bodies is articulated through their 'immaterial' substance in opposition to the material substances of organic bodies. They can be reproduced infinitely in the same form, the evidence of which is in the reproduction of the same general form for all the human bodies in the game. Their materiality is as 'disembodied' simulations. As Robbins (1996) notes, the vision of a new world order of fantasy and imagination, disrupting previously exclusionary categories of difference, can become a (banal) process of rendering *all* identities digital as deliverance from our 'meat' (Foster, 1993a).

Ironically the 'disembodiment', abstraction and similarity of these digital bodies is underpinned by a sense of 'photo-realism'⁸. While such 'realism' in the construction of digital bodies is taken to be a reflection of the world, what it represents is an already constructed ideal of a differentiated ego-body which is historically situated in philosophical and psychological rationalism. (Merleau-Ponty, 1962; Grosz, 1994). While this mechanism generalises an 'ideal' body, it says nothing about the ways that specific bodies are constituted through processes of embodied experience. This creation of a digital body 'map' describes not a physical but an 'imaginary' body (Grosz, 1994; Sofia, 1992), which may or may not correspond to the physical.

The process of rendering all digital bodies the same erases the physical and cultural differences of organic embodiment, and restricts 'choices' about the available ways to 'become virtual'. Whereas popular rhetoric suggests that 'becoming virtual' banishes difference because form is potentially and infinitely variable (Jaron Lanier, in Boddy, 1994), a digital body in and of itself does not necessarily call categories of embodied difference (such as gender or 'race') into question. As Balsamo (1996: 128) notes, the fact of 'having' a digital body in a digital world does not necessarily refer participants to their more everyday embodiments, or how that body is socially organised in relation to others.⁹

In the speculative discourse of VR, we are promised whatever body we want, which doesn't say anything about the body that I already have and the economy of meanings I already embody ... There is plenty of evidence to suggest that a

reconstructed body does not guarantee a reconstructed cultural identity. Nor does “freedom from a body,” imply that people will exercise the “freedom to be” any other kind of body than the one they already enjoy or desire.

Gendered and racialised bodies therefore emerge — partially and ironically — from the notion of casting off the culturally inscribed markers of difference. ‘Generic’ digital bodies are signs situated in symbolic systems organised in contexts of phallogocentric and Eurocentric representation. As we saw in the case of ‘Jack’, the bodies of Dactyl Nightmare are *significantly* marked with cultural signifiers of gender. In these ways social assumptions about how bodies are gendered, and the roles gendered bodies play, are written into the digital bodies of the virtual world. In Dactyl Nightmare there is only one, normalised and ‘disembodied’ body. Difference — physical, cultural, gender difference — is erased from explicit representation. If, however, digital bodies are imperfectly articulated with *particular* physical bodies, both ‘normalisation’ and ‘resistance’ to it are possible depending on the histories, biographies and social relations of the participants. Such subject positions might create dissonance with a subject’s already existing ‘body map’, and offer opportunities to explore bodily difference with regard to ‘everyday’ identities, rather than identify with a (masculinised and normalised) universal digital body along lines of normalisation, or resistance to it.

Whereas in Dactyl Nightmare™ all players share the same representation of a body, in Legend Quest™, a range of different bodies are produced (see Schroeder, 1996 for a full discussion of Legend Quest™). Legend Quest™ adds ‘fantasy’ to the ‘action’ scenario, and uses the metaphors of fantasy game playing in a virtual world. Participants can become any number of characters, from a warrior, to elf, to dwarf, to wizard, to human. The game can be played ‘solo’, or can be networked into a ‘multi-user environment’ so that several participants can enter the same world and interact with each other. In contrast to Dactyl Nightmare™, Legend Quest™ presents a range of different ‘avatars’¹⁰ to be selected before the game begins. A number of personal attributes for a player’s body — surface characteristics such as hair colour or markers of gender — can be selected.

The game is played in a series of rooms, some with bricks to give the ‘dungeon’ feel, which are connected by doorways. Objects in these rooms consist of chests, candles, pictures, lamps and fires. The creatures which participants

encounter as they move through the game include skeletons, wolves, bats and 'maidens', as well as other players cast as wizards or warriors, dwarves, humans or elves (see Fig. 3-6). According to one game player:

like if you choose, let's say a dwarf or an elf as a character, and you spoke to another character in your group, only the fellow dwarves or elves could understand what you were saying and everyone else could hear gibberish. It's to simulate different languages, and I thought that was really neat. But when it actually came down to it, there is one language - English - and your characters would look different - in terms of the clothing they wore ... but they weren't like super short or super tall or anything like that. Your weapons were different. There would be a cross-bow or sword or magic wand or dagger, things like that, and the game play was kind of ... it lent itself well to people who were into role playing (Ben, Interview, San Francisco, March 1996).



Fig. 3-6
Legend Quest™
Virtuality (1993) p. 13
© Virtuality® Ltd.

In some ways, the morphology of bodies is similar across digital worlds, similar enough for one participant to argue that there was continuity across the characters 'when it came down to it'. Despite these variations however, the only part of one's own body that can be seen in Legend Quest™ is one arm.

The cultural inscriptions upon the surfaces of these bodies can change to denote the 'difference' in species, character, gender and hair colour (Grosz, 1994). This signification of a range of differences, making difference present and explicit, presents other kinds of problems than those of the 'generic' body. As Kramarae (1995) argues, where the representations of some material bodies are generally privileged at the expense of others, conventional markers of difference are (re)inscribed which draw on stereotypical boundaries to represent categories of personhood already overly familiar.

These overly familiar categories of difference were employed in a Sega® 'Netmerc' game, installed in a games entertainment centre I visited in Auckland, New Zealand (October, 1996). This game was in the 'shoot-'em-up' genre, was played solo, and consisted of several playing levels in different environments (a desert, city street) connected with 'tubes'. The player is situated on a flying platform containing a 'gun turret' which the player operates to score points by shooting the opposition — in the form of robotic 'tanks' and 'humans' in vehicles.

A 'prebriefing' to this game (see Chapter Five) shows a digital video which features a (well curved) female character in a form-fitting red body suit entering a room containing a gun turret identical to that on which the participant plays. She then puts on the head mounted display and begins to swivel her head and the turret around with fast and intense movement, presumably shooting the digital opponents. Body movements are thus specified, as well as how to initially fit one's body to the machine. The scene on the video then shifts to a first person point of view which demonstrates the forward facing view of the game field with turret, landscape, and opponents moving towards you. There is no representation of a digital body in the game, but rather a pair of dissociated hands clutching the sides of the gun turret. The woman's figure represented in the pre-briefing exhibits all the conventional bodily markers of dominant conceptions of femininity and idealised body shape.

As Mary Ann Doane (1990: 163) argues, 'when technology intersects with the body in the realm of representation, the question of sexual difference is inevitably involved.' This representation often takes extremely simplistic and obvious forms. For example, *The Lawnmower Man* (1992) seeks to represent immersive virtual reality technologies that might exist in the near future. At one point in the film, the two central characters enter virtual reality. They put on

'datasuits', and harness themselves to 'gyroscopes'. As they do so, Jobe, the central male character, tells his (heterosexual) lover that in virtual realities or virtual worlds, 'we can be whatever we want to be'. What they become is illustrated in Fig. 3-7. The virtual bodies assume shape and contour which exaggerates morphological sexual differences between men and women, rather than approximates the differences in the organic forms of the particular people involved. Furthermore, his virtual body is represented in blue, whereas her virtual body is coloured pink.

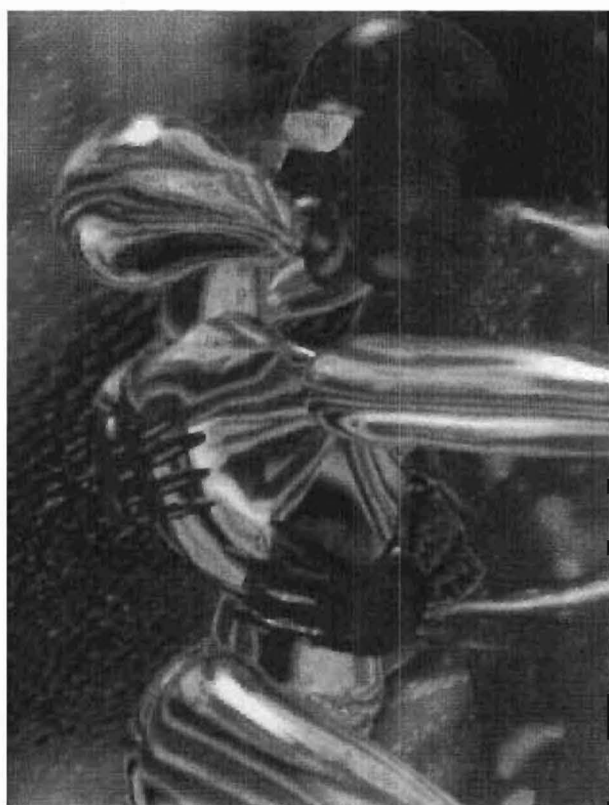


Fig. 3-7
 Jobe and his lover in *The Lawnmower Man*
Computer Graphics World, April 1992
 Photo: Angel Studios
 ©Computer Graphics World

The importance of images such as those in *The Lawnmower Man* is that they closely connect to other popular cultural images and texts of the utopian possibilities presented by new communication and information technologies.

Rather than being presented with 'resistant' digital bodies in digital cultural texts, we are presented with images of digital men, and digital women, whose activities are often defined in terms of hegemonic gender signifiers. As such, virtual reality technologies are 'technologies of gender' (de Lauretis: 1987). As Janet Bergstrom (1991: 35) argues,

where the basic fact of identity as a human is suspect and subject to transformation into its opposite, the representation of sexual identity carries a potentially heightened significance, because it can be used as the primary marker of difference in a world otherwise beyond our norms.

Virtual worlds are 'beyond our norms' because wholly digital 'presence' produces digitally rendered embodiments. Kendrick (1996: 146) argues that the imaginary of digital presence 'represses the implications of the technological real in an attempt to reinscribe the myth of a coherent identity that exists outside and prior to the technologies which create cyberspace. In this sense, cyberspace erases the material effects of virtual technologies on subjectivity. It presents the technological real as a matter of conscious choice, a decision to use or manipulate software that we can turn on and off at will.' As one participant expressed the construction of digital reality as consciousness, '[i]t was quite good, and familiar. I felt like even though I was *consciously* there, you're *there* ...' (Julia, Interview, Auckland, October 1996). This calls 'attention to the coherence of subjectivity as a fiction, yet offer[s] itself as the actualizing of that fiction' (Kendrick, 1996: 146).

The problem of presence is not one of disembodiment, but a specific kind of embodiment — and as such, 'we' must take responsibility for its formation (Haraway, 1997). According to Robins (1996: 13)

virtual realities ... confound the boundaries between internal and external worlds, creating the illusion that internal and external realities are one and the same. Artificial reality is designed and ordered in conformity with the dictates of pleasure and desire ... Under these conditions of existence, it appears as if there are no limits to what can be imagined and acted out. Moreover, there are no others (no other bodies) to impose restrictions and inhibitions on what is imagined or done.

As such, virtual worlds constitute a refusal of relations of dependency and mutual responsibility.

There are means of taking critical responsibility for such boundary confusions, however, within the practice of virtual world building. Not all immersive digital worlds use the conventions of presence in photo-realistic worlds to construct identities and bodies in digital spaces. One digital world which uses alternative conventions is OSMOSE©, an installation art work constructed by Char Davies of Softimage Inc., Canada. This is a world which, like the Virtuality® games, is generated through the use of a head-mounted display, but uses breathing to move and orient in the virtual world, rather than handsets (see Chapters Four and Eight). A sense of embodiment in this world is generated through a point of view, a gaze, and does not entail assigning a ‘puppet’ body to a participant in the digital world. Meanings around embodiment and disembodiment therefore come entirely from the ways that a ‘point of view’ is constructed through perceptual and perspectival mechanisms, and the surfaces of digital objects, such as those of the ‘forest’ world, below (see Fig. 3-8).

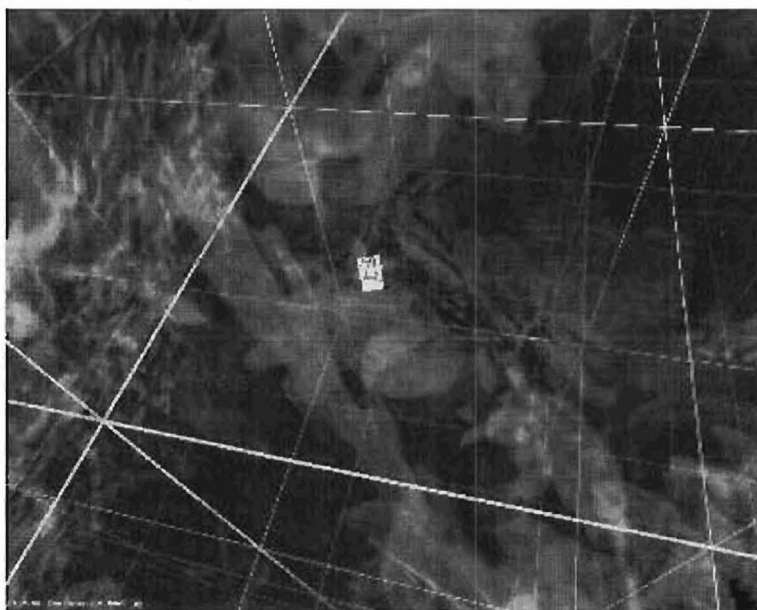


Fig. 3-8
 ‘Forest’ in OSMOSE©
<http://www.softimage.com/projects/osmose>
 OSMOSE: Author Char Davies
 © (1995) Softimage Inc. All rights reserved.

I will address the implications of perspective and point of view for constructing virtual experiences more fully in Chapter Four. Here, it is sufficient to remark

that being ‘dispossessed’ of a body offers possibilities for ambiguity in the construction of self and bodily experiences, as will be elaborated below.

In OSMOSE©, the surfaces of digital objects are deliberately vague, luminous rather than hard-edged or photo-realistic. OSMOSE© is not one world, but rather multiple worlds with multiple connections between them. It is an assemblage of a number of interactive and immersive environments which seek to explore and elaborate the connections between technology, nature and embodiment. As one participant described it,

It’s like a mythological kind of nature. It’s the way you’re following light, and looking at the way light is moving around and things, but then there’s like these sort of solid forms that aren’t really solid and you can float through them (Davies, 1995a).

Both an ‘immersant’ (participant) and an audience perceive the digital worlds of OSMOSE© through images and sound through a head mounted display (like ‘game worlds’). The digital world constructed in OSMOSE© comprises several worlds within a world — text, cloud, clearing, tree, leaf, forest, subterranean earth, pond, abyss, code, cartesian grid and lifeworld. These worlds are three dimensional (so movement includes up and down as well as side to side and forward and back), but Char Davies represents the worlds textually in a two dimensional schematic (see Fig. 3-9).

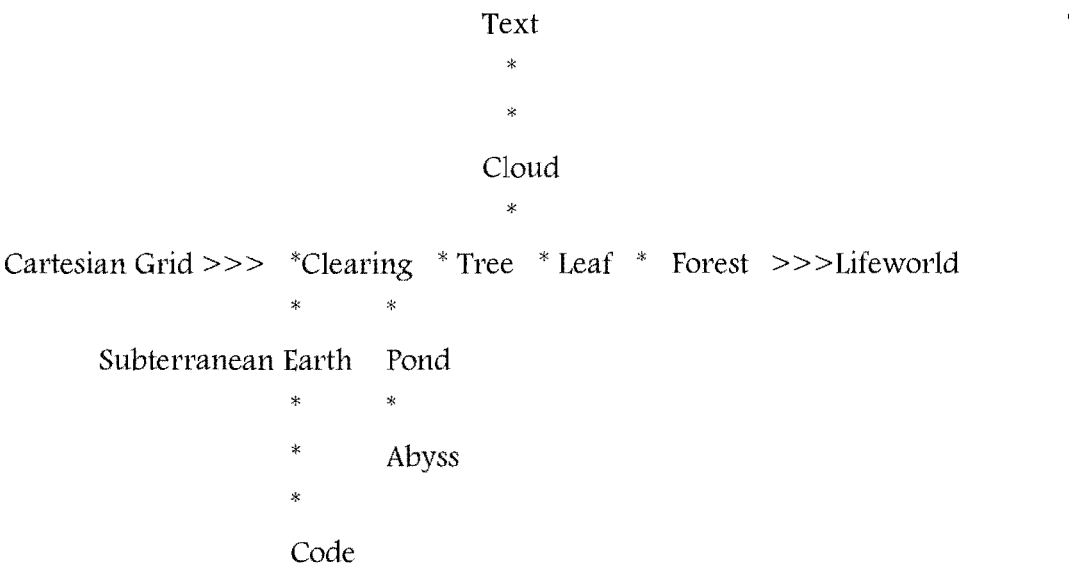


Fig. 3-9
OSMOSE© Schematic
Davies (1995) p. 3

The immersant travels through each of these worlds, such as the ‘forest’ world depicted in Fig. 3-8, via bodily movement.

Most of these dozen world spaces are presented as ‘archetypal’ elements of nature, and these elements are framed through referential worlds — the Cartesian Grid for initial orientation, the textual ‘superstratum’ (excerpts of Davies’ writings on OSMOSE©, and poetic/ philosophical writing on nature-technology relations) the code ‘substratum’ (comprised of some of the code used to generate the worlds in OSMOSE©), and the ‘lifeworld’, which draws the participant out of the worlds at the end of the experience. These worlds are interrelated and overlapping. It is possible to move through them, but also to hover between them, and to experience different elements of each world simultaneously.

The aesthetic of OSMOSE© is an extension of themes that Davies has explored firstly as a painter, more recently as a digital artist. The visual aesthetic is one of ‘transparency and ambiguity’, a development of a representational form which concentrates on the ‘implicit, interior qualities [of forms] rather than phenomenal outward appearances’ (Davies, 1995: 3) through notions of luminosity and envelopment.¹¹

As one participant (in Davies, 1995a) describes it, the experience is ...

[j]ust to be there floating. Other environments, they’re all so solid and so fake because of that solidity. And you can just tell that there’s nothing real about it whatsoever. And you get into that (OSMOSE©) and it’s a unified, complete piece that’s all of a whole, and the light, and the transparency and the texture, and the way you move. It’s stunning.

The aural aesthetic also strives for ambiguity. The composition, sampled from a single male and single female voice, moves with the position and location of the immersant in the work; the organically generated sounds designed to underline and emphasise the role of human embodiment in the spaces of OSMOSE©.

This speaks to the connections between self, embodiment, ‘nature’ and technological spaces — and as such offers subject positions which rely on a discourse of reciprocity and accountability between selves and multiple environments. On the one hand, OSMOSE© can be read as instituting a romanticised nature which is outside the everyday ‘nature’ which is being progressively colonised and degraded. On the other hand, OSMOSE© encourages a self intimately connected on an everyday basis to that nature (by

virtue of organic being), and so opens possibilities for conceptualising nature as an element of self, thus encouraging responsibility and accountability to that nature.¹² Certainly many immersants experienced it this way when the work was installed at the Musée d'Art Contemporain (Museum of Contemporary Art) Montréal, Quebec, Canada, from August 19-October 1, 1995, as is evidenced by the comments on the Softimage website ([http:// www. softimage. com /projects/ osmose](http://www.softimage.com/projects/osmose)).¹³ The comments point to the language participants associated with their experiences, and so points to the ways they are positioned by the work.

'OSMOSE is a reconciliation with nature through technology, a reconciliation with technology also contrary to what we're used to, gentle and peaceful. OSMOSE is truly a beautiful reconciliation. Thank you.' LP

'What a beautiful concept! The clearing, the tree, the poetry above the clouds and the computer code beneath the roots. Truly a beautiful idea for us to experience. I loved it. OSMOSE is being one with nature on a micro-level rarely experienced... except maybe in a meditative state. Thank you for producing such a reality.'

'Thank you for giving me this experience! This work gave me a feeling of being connected to the natural world of being immersed in nature and being a part of that nature. It is a unique experience that I hope many others will share.' MT

At the same time, the aesthetic, and representation of archetypes, makes rendering 'nature' problematic, and draws explicit attention to the work as a specifically technical artefact, and 'beyond' nature in that sense.

As the artist (Davies, 1995: 7), puts it,

[A]s a realm ruled by mind, cyberspace is the epitome of Cartesian desire, in that it enables us to create worlds where we have total control, where the presence of aging moral flesh and animal-others is absent, where there is ... no "dirt". Popular and media-hyped expectations of "virtual reality" seem to reflect a longing to transcend the limitations of our physical surroundings, and indeed, its long-term effect may be to seduce us to turn away en masse from our bodies and Nature. ... I believe that this desire to escape the confines of the body is symptomatic of an almost pathological denial of our materiality and mortality ... a testosterone induced dream.

OSMOSE© has resonances with other virtual worlds produced as 'art'. Placeholder (1993), for example, creates worlds similar to OSMOSE© in representational aesthetic, in 'point of view' mechanisms, and themes of nature-technology-embodiment relations. Placeholder was developed by Brenda Laurel and Rachel Strickland for Interval Research Corporation, in association with Banff Centre for the Arts in Banff, Canada.¹⁴ The world simulates three different environments around the Banff Centre for the Arts in Canada. The environments

include vertical rock formations close to Banff (known locally as the Hoodoos), a mountain waterfall (see Fig. 3-10), and a cave scene from Banff's local environment. The environments in Placeholder are animated, and face icons resembling petroglyphs act as 'voiceholders' which play back recorded messages participants have left at the scene.¹⁵

Placeholder strives for a similar sense of presence as that of OSMOSE©. This world changes the participants' point of view on the world (two 'players' can participate at the same time) depending on 'bodies' that are selected before the world begins. Like OSMOSE©, the participant has no puppet body which they can visually sense, but rather their sense of their digital body is constructed through their vision of the surfaces of other objects in the digital world.

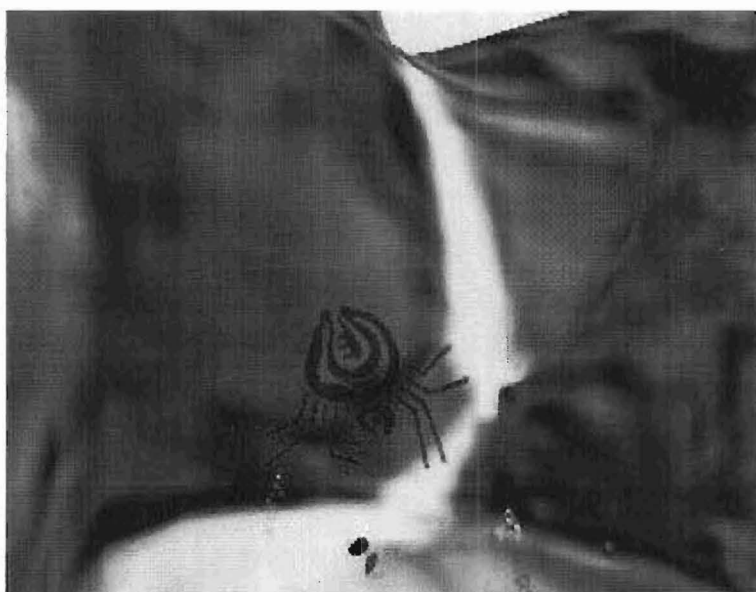


Fig. 3-10
'Waterfall' in Placeholder
with 'spider'

<http://www.interval.com>

Authors: Brenda Laurel and Rachel Strickland
© Interval Corporation

Like some Virtuality® worlds, there are choices as to the kind of 'body' one can have, but embodiment is fundamentally rendered as a perspective on the world (Hayles, 1996).

Embodiment in Placeholder is coded through the assignation of corporeal forms that the creators call 'Smart Costumes' (Hayles, 1996). Participants can

choose one of four forms — spider, crow, snake or fish — which determine the individual's visual and auditory appearance in the virtual world. The participant's point of view and their means of movement are consistent with the bodies of the characters they have chosen/become — for example, crow can fly, and snake perceives infrared. According to Hayles (1996: 17), crow and spider are gendered through their voices (which are masculine and feminine respectively), whereas fish and snake tend to be gender indeterminate. Furthermore, participants can 'shapeshift', becoming other characters by touching an icon representing the totem of a creature.

Placeholder allows interaction between participants, as well as interaction with the environment. The experience is centred around the creation of narratives through the relationships between participants and their environments. Direction and encouragement for this activity comes from a character in the environment called the 'Goddess' who, played by an individual watching the digital simulation from the 'outside' via a monitor, projects comments and suggestions 'into' the digital world. The overall emphasis of Placeholder is therefore the stories that are created out of an individual's embodied interaction with their environment, and the connections between a specific point of view and the ways that gaze configures relationships with environments and other beings. Laurel (1991) argues that the construction of computer interfaces relies on a metaphor of the dramatic. What is important, therefore, is not a perfect presence via immersion as is the case in *Virtuality*®, but a suspension of disbelief via compelling storytelling. Like *OSMOSE*®, evocative signs and symbols in Placeholder are more important than a dominating realism. The range of totemic characters such as those presented in Placeholder render the performativity of identities and bodies obvious (Butler, 1990). If digital bodies are 'performative' rather than essential, they 'offer imaginative sites for more radical performativity' (Fuchs, 1993: 15), a performativity which disrupts stable gendered identities and 'bodily contours [reliant upon] fixed sites of corporeal permeability and impermeability' (Butler, 1990: 132).

The notion of performance confounds a 'pure' or straightforward sense of presence and identity, and instead invokes simultaneity and multiplicity — a sense of possibility in the embodiment of culture and social relations. The sense of presence and identity invoked is not, however, unproblematic. Charges of

colonisation — of inappropriately using technology to appropriate the signs of indigenous cultures as ‘other’ — are possible in the case of Placeholder. Some argue that such appropriation romanticises the places and stories of indigenous groups, and does not acknowledge or do anything for those peoples’ ‘real’ social situations, which are so often situations of marginalisation. Laurel (in Morgan, 1994) claims, however, that ‘first world’ — American — peoples can nevertheless learn from being taken out of their conventional or everyday worlds, and offered alternative means of understanding their relations with others. As such, they become active ‘readers’ and ‘writers’ of embodiment and identity with a broader repertoire of cultural understandings from which to construct their worlds. How representation comes together with narratives and genres to provide resources for particular ‘readings’ and ‘writings’ of identity is the subject of the next section.

Reading Virtual Embodiment

We read with our bodies. Texts invite different bodily-emotional responses. Some leave us cold, some make us feel sick, others voracious, turned on, high, joyful or sad. A text can set up rhythms in us, set us singing, set us dancing.

Game and Metcalfe *Passionate Sociology*

The digital spaces I have described thus far are worlds — spheres or spaces of social interaction. As Anne Game (1991) notes, representation is a social sphere, and conversely, social worlds can be read as ‘texts’. The reading(s) I have so far provided of digital worlds describe the ways representations depict categories which operate relationally with other categories of identity and difference. As such, they are abstract. They depict ‘masculinity’, not men. They depict ‘individualism’, not individuals. Furthermore, those readings are at least in some ways specific to my history and biography, and specific to a sociological and analytic story. Importantly, other readings are possible, and more than one deconstructive story can be told about any text.

Thus, the representations which construct ‘presence’ as I have already described it are not ‘objective’, but provide resources through which people construct certain types of stories and narratives about their own embodiment and identities as they ‘become virtual’. However, other interpretations can be

offered for the conventions which, I have argued, code ‘disembodiment’ and transcendence. The point of view in OSMOSE©, while ostensibly connecting an organic embodiment simultaneously with a digital world, can equally code ‘disembodiment’ through its production of digital, immaterial, etheric (and therefore ‘disembodied’) images. Particular representations of ‘the natural’ — in the form of trees, rocks and streams — mediates ‘the natural’ as technological (recouping ‘nature’s’ otherness), as well as positioning nature’s ‘otherness’ relative to the human spectator. Even though OSMOSE©’s nature is ambiguous and multiple, the representations in themselves make no reference to the arguably ‘natural’ specificities of the participant’s embodiment. By leaving the question of specific embodiments ‘open’ (or at least ambiguous, inferential), OSMOSE© also implies positions of presence which conform more closely to dominant readings of presence as ‘disembodied’ or transcendental, and the repression of the material body to consciousness.¹⁶ One participant (in Davies, 1995a) talks about feeling quite *disembodied* in OSMOSE©:

I wasn’t really conscious of my body at all, it was, like, the first few minutes you have to adjust to the space and then after a while I kind of completely forgot where I was or what I was doing. Like I wasn’t thinking that I was in a museum or anything like that. Okay, I’m here, I’m in this space, I’m moving around, I’m swimming. And just an incredible feeling, sort of like dying and going to heaven or something.

Similarly, the bodies in Virtuality® games can be read as paradoxical in their coding of embodiment. In an alternative reading of Dactyl Nightmare™ than that I presented earlier, having a body in a digital world *does* refer a participant back to the material and organic sense of being embodied (or having a body) in their everyday life. Because games like Dactyl Nightmare code particular bodily attributes onto the digital body, those markers become available for participants to negotiate as *always already* materially embodied beings. The shape and form of the digital body, and the colours on the surfaces which code clothing or skin colour or hairstyle, point to the ways these markers of difference are explicitly constructed, and therefore open up performative possibilities.

Gender and other subjective investments in identity (Moore, 1994) emerge from the biographies, histories, bodily activities, and performances of participants. In Dactyl Nightmare, digital bodies only become ‘masculine’ when the participant concerned is acting against a digital body generated randomly by

the computer. In a networked game, the generic bodies take on the more 'everyday' and performative genders of the participants — no matter what they look like. For example, women can and do experience the digital representation of their own body as female.

I mean I went as a woman and I was a woman in the thing. And you can dial up a woman if you're a woman, and play a guy. ... You were on a floating platform in space with stairs, and you're going up and down stairs ... and, you know shoot and seek out this other and survive. It was interesting because the guy I played with had a goatee, and his character on the screen had a goatee. I don't know if that's a coincidence or not, but it was quite weird. And I was a woman, definitely, you know. I was a woman in virtual reality, as I am in real life. It made a difference in the sense that it seemed more real, like if I was a bloke, a man in the game [grimace]. But I was a curvaceous woman and I played it to suit me (Cate, Interview Auckland, October 1996).

When playing the game for the first time I assumed that my generically shaped opponent, generated by the computer, was 'male' even though I could see myself rendered the same way, and thought of myself in terms of my 'everyday' embodiment as a woman. Rather than challenging or overriding my sense(s) of gendered self, the digital signifiers supplemented the performance of my 'everyday' gender.

As is the case in other social worlds, dominant, negotiated and critical readership positions are all available to different degrees in the case of any 'text'. Because signs are fundamentally polysemiotic, the greatest efforts to secure meaning nevertheless simultaneously code other available readings. Meaning only resides in the world — in materially and culturally inscribed objects (however digital) — in so far as the human subjects who are the creators and interpreters of cultural and social interaction are taken into account (Gottdiener, 1995: 172).¹⁷

This renders a number of subject positions, and resistances to dominant meanings and stories possible, as can be seen in participants' multiple readings of worlds. As Valverde (1991) points out, 'subject positions' are not 'social subjects'. While subject positions are 'spaces', structured by signs in texts which are abstracted from the lived realities of bodies, the 'subjectivity' of persons can be described as 'the conscious and unconscious thoughts and emotions of the individual, her sense of herself and her ways of understanding her relation to the world' (Weedon, 1987: 32). Subjectivity is multiple and fundamentally

‘incoherent’. Whereas the ‘subjects’ of texts are abstract positions, in social relations those positions are (albeit variously) occupied by specific bodies who live and act in the world. As Valverde (1991: 182) argues,

Subjectivity is never singular ... Rather, it is always fragmented and always in flux. The fragmentation is not due simply to the co-existence of domination and resistance, but also to the simultaneous presence of a number of distinct discourses converging on a particular social subject with varying degrees of effectivity. Some of these are the discourses of political and social domination; others are the alternative discourses provided by feminism, socialism, and so on; and many are quite ambiguous and have effects which cannot be identified by a prior structural analysis ... [E]ach discourse creates a wide variety of subject positions, some of which are meant to co-exist, while others are meant as alternatives to one another.

The Sega® Netmerc game offers a number of contradictory means of understanding self and gender in that world. The prebriefing video which showed a woman operating the gun turret was one such resource. The ‘disembodied’ point of view which did not assign a body (differentiated or generic) was another. The assumption of ‘everyday’ embodiment was another. When I asked one participant to draw how he looked in the digital world, and how he looked using the system he drew a female and male figure respectively (see Fig. 3-11). The female figure on the left corresponds to the digital body demonstrated on the video, and sits in front as a projection of the male figure on the right.



Fig. 3-11
Don's drawing of his
doubled identities

The prebriefing had informed his assumption of a gendered performative identity for the duration of the game, consistent with the video rather than his everyday gender.

The issue therefore revolves around how people make sense of their embodiment in virtual realities in relation to the way that experience is 'framed'. Henrietta Moore (1994: 64-65) draws on the work of Wendy Hollway to argue that such framing is not the full story:

If at any time there exist several competing, possibly contradictory, discourses on femininity and masculinity, then what motivates individuals to take up one subjective position as opposed to another is their degree of 'investment' in a particular subject position. Hollway conceives of an investment as something between an emotional commitment and a vested interest. (Her use of the term has a strong connotation of cathexis). Such interest or commitment resides in the relative power, conceived of in terms of the satisfaction, reward or payoff, which a particular subject position promises, but does not necessarily provide ... [I]t is useful precisely because it allows us to retain a link between question of power and question of identity. If we imagine that individuals take up certain subject position because of the way in which those positions provide pleasure, satisfaction or reward on the individual or personal level, we must also recognize that such individual satisfactions have power and meaning only in the context of various institutionalized discourses and practices, that is, in the context of certain sanctioned modes of subjectivity.

Moore goes on to point out that intersubjectivity, the relation of 'self' to 'other' is always at issue in such investments, and that the tangible benefits that accrue from 'hegemonic' discourses can be considerable. There is no socially or institutionally sanctioned benefit to make Don question his everyday embodiment as a masculine subject, even as he 'maps' the body image of a woman across his representation of his masculine self — this is a world framed off and need not touch everyday realities. The important thing to note is that these dynamics are *processes*. The construction of continuity in body and identity is an everyday *achievement* which does not reach 'resolution' or coherence, but is continually unstable and contradictory. This suggests that virtual embodiment (whether assigned a digital body or not) does not in itself challenge the assumption of everyday genders, nor the dominant ways those gender performances are inscribed in the bodies of social subjects.

There are two senses in which participants 'read' virtual worlds and VR technologies. The first is in their processual interpretation of the symbolic aspects

of a world and technology.¹⁸ A range of worlds and of readings offer disparate and sometimes contradictory positions for individuals to take up or invest in. The worlds considered here suggest unequivocally that there is instability and multiplicity inherent in writing and reading texts of digital worlds.¹⁹

The second way people 'read' texts is through the practice of them; everyday life is creative because it involves the practice of texts (de Certeau, 1984: 32-33), and a social text is actualised in its practice (Game and Metcalfe, 1996). That is, people's histories, and the competencies they derive from a range of other social worlds they already inhabit (and through which they perform their embodiment), are brought to bear to make sense of embodiment and experience in the digital world. An important source of such competencies for making sense of virtual worlds are the conventions of narratives and their interpretation derived from other media.

Stories

VR computer technology can be approached as a kind of fiction made physical. At the same time it is a machine to create fictions of ourselves.

Catherine Richards *A Letter on Fungal Intimacy*

The mass medium of television gained its power through assimilating earlier forms of narrative such as movies, novels, comic books and cartoons (as well as being positioned in the domestic sphere rather than the public realm) (Kinder, 1991: 37). In just this way, virtual worlds gain power through assimilating some of the symbolic and narrative conventions of video games, television film, as well as novels, and more recently, internet and new communications technologies. People have learned to read and interpret media conventions over the course of their lifetimes, through both experience of multiple media, and of the contexts in which their images make sense. Narrative form, for example, has been historically established in the west through specific literary and narrative techniques associated with particular forms of writing (such as 'the novel', or 'journalism') as predominantly linear, individualist and particular, and rising from a realist tradition (Watt, 1957). As one participant noted with respect to the correspondence between Dactyl Nightmare™ and other video games,

Dactyl Nightmare was always the most popular game. The thing about Dactyl Nightmare — people recognised it. They've seen it before ... friends have told them about it ... it's kind of Pacman-type game, you know ... you'd gladly put a quarter into it because it's Pacman ... you know what it's all about (Ben, Interview, San Francisco, March 1996).²⁰

The ways that camera angles, lighting, and editing procedures are carried out in both film and television are examples of the ways in which people have learnt to make sense of representations which narrate time, space, character and theme.

When I first rendered my own account of Dactyl Nightmare, I made specific recourse to film metaphors to describe my experiences.

The feeling when the scene in front of your eyes 'comes to life' is very difficult to describe. It's like when movie begins with a still black and white shot, which suddenly becomes coloured, and in the space of an instant becomes more 'real' with the movement (Fieldnotes, Auckland, January 1995).

The practices of image making and the images they produce have been transformed over time, through both technical and cultural changes. Ways of seeing and understanding media images are now taken for granted in western worlds, but historically people saw differently (Crary, 1990; Berger, 1974). Furthermore, popular photography, and new computer technologies (amongst other technologies), have also made contemporary media audiences familiar with producing their own images and publishing them. In producing their own images, individuals draw on knowledges and perceptual practices, learnt over time, of how to see, read, make sense of, decipher, decode the visible representations with which they are presented (Cartwright, 1995). These assumed knowledges are particularly important in decoding the narratives and genres of virtual worlds.

Familiar forms of narrative and genre create compelling virtual worlds. Virtual worlds, as a combination of stories (genre and narrative), interactivity and intertextuality, draw on identities similar to those described in other popular stories. The genres in which these identities are embedded are comprised of a combination of technical practices, bodily activities and symbolic forms which meld to produce a particular style of narrative form, or different types of stories. One of the most obvious comparisons between the virtual realities presented here and other genres of storytelling is in the similarities between the narratives in VR

and other forms of gaming. There are different kinds of games, played for different purposes, and needing different forms of identification and engrossment.²¹ Simulation games, war games and fantasy role-playing games all contribute to some of the ways in which VR worlds are created.

As Friedman (1995: 74) argues in the case of computer games, with which some virtual realities are aligned, 'learning how to play computer games is a process of learning a distinct semiotic structure. To some extent, this language, like that of classical Hollywood narrative, carries over from one text to the next.'²² Overwhelmingly, these games employ a formula, known throughout entertainment industries that, as one consultant put it, you 'don't mess with'. One of the reasons you don't mess with it is because the themes are familiar, and have even become mundane over time where once they were fantastic.

Virtual realities can operate intertextually by offering storylines and scenarios that are familiar from other video and computer games. These narratives are significant in the case of Virtuality®, particularly as these are most often found in arcades or other leisure based entertainment venues (see Chapter Five). Zone Hunter and Grid Busters, for example, both Virtuality® games, use futuristic scenarios and science fiction genres to immerse the players in worlds. Both of these games are played in networked scenarios, and the players are assigned bodies. As one player described Gridbusters, 'you're in a gladiator arena and you've got a rocket pack ... and some major weapons like a missile launcher or laser guns or just big guns ... and you fly around trying to blow everybody up' (Ben, Interview, San Francisco, March 1996).

These Virtuality® worlds draw their inspiration mainly from the genres of fantasy and science fiction, which includes both print and visual media such as television and films. The heroic narrative and science fiction both reflect and speak to predominantly young male audiences (although female versions have more recently emerged — such as the red-body-suited warrior in the Netmerc game), and construct an individualist 'heroic' subject who overcomes challenge and adversity to develop a self-identity (and save a few worlds along the way). The qualities of this subject are strength, independence and initiative. Grixiti (1994) argues that such narratives, embedded as they are in a wide range of consumer culture industries, produce sites of political struggle over western identity and otherness. '[T]he cultural role performed by the concept in its consumer-oriented guise is one of *repressive triviality* ... Its power to appeal

rests largely on a perceived ability to offer reassurance about the appropriateness of alienation ...' (Grixti, 1994: 222) in contemporary societies. The implications of this for cultural (and gendered?) intersubjectivity is that such narratives layer understandings of self and other in local contexts, and interact with (socio-historical) networks of relation to provide particular possibilities for the (re)inscription of self in cultural and subjective politics. The extension of these narratives in virtual reality technologies can articulate expanded possibilities for escape or transcendence in which responsibility for the construction of cultural, gender and ecological relations can be safely avoided.

The 'puppet' that players are assigned in these games take on 'hyper-masculine' surface characteristics (Springer, 1993; Foster, 1993a). This cyborg body is best represented in films such as *Robocop* (1987) and *Terminator 2: Judgement Day* (1991), where the cyborg is presented as the invincible, hard armoured, and particularly masculine body. These hyper-masculine representations provide a hermeneutic 'map' for inscribing ideals about the exploration of digital/ science fiction frontiers and their embodied differences from present, mundane embodiment. These bodies were described by one participant as 'cyborg warriors' (see Fig. 3-12).



Fig. 3-12
 'Gridbusters'
 Virtuality (1993) p. 13
 © Virtuality®

The cyborg bodies of cyberpunk fiction explore alternative definitions and configurations of what it means to be 'human' in a technological, post-humanist landscape. Given the particularly gendered appearances of the 'invincible

armoured cyborg' (Springer, 1993) which informs some genres of virtual reality, Fred Pfeil (1990) and Andrew Ross (1991) have argued that for all its dissolution of boundaries, cyberpunk remains rooted in a masculinist framework. As Ross (1991: 145) argues, '[o]ne barely needs to scratch the surface of the cyberpunk genre, no matter how maturely sketched out, to expose a baroque edifice of adolescent male fantasies':

Cyberpunk male bodies ... [hold] no ... guarantee of lasting invulnerability, at least not without prosthetic help: spare, lean and temporary bodies whose social functionality could only be maintained through the reconstructive aid of a whole range of genetic overhauls and cybernetic enhancements. ... The body as a switching system, with no purely organic identity to defend or advance, and only further enhancements of technological 'edge' to gain in the struggle for competitive advantage. These enhancements and retrofits were technotoys that boys always dreamed of having, but they were also body-altering and castrating in ways that boys always had nightmares about. ... If the unadorned body fortress of the Rambo/Schwarzenegger physique expressed the anxieties of the dominant male culture, cyberpunk technomascularity suggested a growing sense of the impotence of straight white males in the countercultures (Ross, 1991: 152-153).

The 'shoot-em-ups' as a genre of video or computer games (not to mention film, television and books oriented around cops and robbers, cowboys and indians) are not the only kinds of virtual worlds in which individuals can participate. Often, people who participate in virtual worlds are explicitly resistant to particular activities in the games, and describe other experiences they might have liked to explore. As one participant put it,

(Julia) Disappointed in the shooting. You'd think they could make a better virtual world without shooting.

(Nic) What would you like to have done in a virtual world, rather than shooting ?

(Julia) Space travel, space travel. Flying would be good. Just the ability to fly... would be cool (Julia, Interview, Auckland, October 1996).²³

As we have seen, OSMOSE© and Placeholder tell alternative stories to those available in 'entertainment' worlds. In the case of Placeholder, participants are explicitly invited to create the story by leaving voice markers in the text of the world, making it the most interactive of the worlds I explored in this sense.²⁴ These spaces evoke responses rather than elaborate explicit narratives. In this way, participants in that world construct their own stories around the sensory resources with which they are presented. One participant likened the experience of OSMOSE© to exploring the contents of someone's mind:

I didn't feel threatened, it felt very magical, very mystical kind of place. It felt very comfortable moving around in it. It's incredible to see what that looks like, to see the way that you can just kind of move around inside someone's mind almost ... and yet, it's not just about inside their mind it's about outside their mind as well (Davies, 1995a).

Another described it thus:

I mean it's very easy, very intuitive. You have this sort of sense like you're a traveller, like you're on a journey, and part of it seems almost like you're not controlling the destiny of the journey, and part of it is, it's sort of like you're ... you've got these choices that you can make but eventually you're going to be somewhere anyway (Davies, 1995a).

In this sense narrative multiplicity replaces the linearity prompted by rigidly time-bound tales. Placeholder and OSMOSE© have more fragmentary and self-exploratory narratives than those with definitive time or skill limits like Virtuality® or Sega® Netmerc worlds. Such sensory multiplicity draws attention to experiencing the world as the central point of VR technologies — the experience becomes the story that is told by the technology, as much as by the medium. In this way, these worlds are not 'stories' per se, because the forum is interactive.

They nevertheless express the histories and biographies of their producers, as well as of their readers. In this sense, the themes of both OSMOSE© and Placeholder are echoed in 'Detour: Brain Deconstruction Ahead' is a world which attempts to simulate the effects of a car accident on one woman's way of physically perceiving the 'real' world. Rita Addison had been a nature photographer until a car accident rearranged her neural networks, and her ways of perceiving the world changed. She could no longer interpret the images and sounds her perceptual networks constructed. The Electronic Visualisation Laboratory (EVL Lab) at the University of Chicago at Illinois, created a virtual world which, although not immersive, represented Addison's changed perception. This at least in part communicated the effects of brain injury on perception (an animated, real time clip of 'Detour: Brain Deconstruction Ahead' can be viewed at <http://evlweb.eecs.uic.edu/evl/vroom/html/projects/45Addison.html>). To attempt to simulate physical and perceptual differences, in order to create a work of art and to promote empathy with the multiplicity of

embodiment, is one way that narratives of VR address, and are embedded in, the 'body politics' outside the digital world itself. It speaks directly to sites of struggle in contemporary politics of subjectivity.

Goals, experiences, stories and narratives in a world therefore construct subject positions for those participating. One means of thinking about these subject positions is as cyborg bodies: hybrid forms of material and digital substance, informed by a range of identities, narratives, objects and meanings. The struggles over the forms of these virtual hybrids are struggles to construct (or reinforce already existing) social subjects as experiencing bodies and experiencing selves, with knowledge, competency and desire for the virtual. Such a cyborg politics create the prototypes of what virtual identities might be. While they often rehash overly familiar and problematic identities and desires — mastery, individualism, control — they can also confuse boundaries.

In a feminist vein, Donna Haraway (1990) has explored precisely these issues in her *Manifesto for Cyborgs*. According to Haraway, the cyborg figure provides an 'ironic myth' for feminist explorations of the relationship between humanity and technologies, a political tool which can be used to resist and subvert the 'Informatics of Domination'. Specifically, Haraway explores the disruption of boundaries and proliferation of contradictions in contemporary social and cultural worlds through the intensification of technology, and in so doing attempts to open the field of feminist theorisation of socially embodied relations lived through the technological.

According to Haraway (1990), resistance to domination can no longer take place through an appeal to integrated notions of the body or identity as based in the subordinate categories of dualisms imposed by western thought, such as bodies grounded in 'unalienated labour', or in notions of the essential body of 'woman' based on 'natural' sexual difference. Instead, feminist resistance should be lived through the image of the cyborg: 'a cybernetic organism, a hybrid of machine and organism, a creature of social reality as well as a creature of fiction' (1990: 193).

In Haraway's (1990: 194) argument,

The cyborg is a creature in a post-gender world; it has no truck with bisexuality, pre-Oedipal symbiosis, unalienated labour or other seductions to an organic wholeness through a final appropriation of all the powers of the parts into a higher unity.

Such a description suggests that the cyborg is a particularly *solitary* state, and Haraway's work has been criticised for overemphasising the potentially positive political implications of the cyborg figure (Doane, 1989; Crosby, 1989; Scott, 1989). Haraway has, however, privileged a resisting feminist reader for the meaning of cyborg imagery (Penley and Ross, 1991), and has argued that the ironic myth of the cyborg for feminism depends upon taking the cyborg as female, as 'a girl who is trying not to become Woman' (Haraway, in Penley and Ross, 1991a: 20).

Even for those 'already cyborg', however, the 'identity crises' created and pursued in 'real' worlds are not necessarily mirrored in virtual worlds. Indeed, as Kevin Robins (1996: 11) notes, '[t]echno-reality is where identity crises can be denied or disavowed, and coherence sustained through the fiction of protean imagination; or it is where the stressful and distressing consequences of fragmentation can be neutralised, and the condition experienced in terms of perverse pleasure and play.' 'The virtual' does not unambiguously reflect already established identity categories. Nor, however, does it necessarily challenge them. Virtual identities remain in 'ambiguous determination' despite attempts by culture industries to appropriate their form for dominant forms of embodiment, genre and narrative.

Conclusions

As Hiro approaches the street, he sees two young couples ... The couples coming off the monorail can't afford to have custom avatars made and don't know how to write their own, they have to buy off the shelf avatars. One of the girls has a pretty nice one ...

The other girl is a Brandy. Her date is a Clint. Brandy and Clint are both popular, off-the-shelf models. When white trash high school girls are going on a date in the Metaverse, they invariably run down to the computer games section of the local Wal-Mart and buy a copy of Brandy. The user can select three breast sizes: improbable, impossible and ludicrous. Brandy has a limited repertoire of facial expressions: cute and pouty; cute and sultry; perky and interested; smiling and receptive; cute and spacy. Her eyelashes are half an inch long, and the software is so cheap that they are rendered as solid ebony chips. When a Brandy flutters her eyelashes, you can almost feel the breeze.

Clint is just the male counterpart of Brandy. He is craggy and handsome and has an extremely limited range of facial expressions.

Neal Stephenson *Snow Crash*

If Neal Stephenson is to be believed in this science fiction scenario, the markers of gender boundaries and gendered relations with technology will not much change with technological development in computing and new communications technologies. At the same time, we cannot assume that stereotypes like those above will be mapped in a simple way into cyberspaces. It seems that virtual reality technologies pose questions for their participants about the *specific* embodiments which can be produced from particular worlds, and how they are produced. The questions posed for cultural theorists are how such bodies are politically accountable.

The ways that virtual worlds signify 'being' draw on ideologically framed meanings about the categories of difference which structure power relations. This signification process produces meanings about embodiment and subjectivity in relation to sometimes fraught lived experiences of computer technologies. Virtual worlds are emphatically paradoxical spaces, but are not yet 'hardened'. The cultural texts/ virtual software which already exist are both determinative and non-determinative of historical possibilities. As Boddy (1994: 122) argues,

In such a model of ambiguous determination, it is important to consider the historical agency of the ephemeral, fantastic and utopian discursive responses to new communication technologies as well as their more materialist determinants in our culture.

Such fantastic discursive responses, as well as materialist determinants, are embodied by those who participate in virtual worlds in multiple ways. As can be discerned from the stories they tell, participants bring their knowledges and competencies of everyday worlds to their participation in virtual worlds. These competencies are grounded in the *multiple* social worlds to which they belong, and in which they ground their identities. This multiplicity confounds any simplistic statements about the material or subjective effects of virtual reality technologies on human bodies. The issue to be addressed in virtual reality technologies is not one of 'disembodiment', but of the specific embodiments produced, through what techno-cultural means, and their effects in cultural politics.

It seems difficult at times to read abstracted digital bodies sympathetically, as bodies which hold the potential to rework conventional categories of self, of gender, of 'race'. This is often because 'reading' virtual bodies makes *obvious* the

social practices of boundary marking which construct critical differences. Because these virtual bodies are new technical hybrids, we can map *how* those bodies are being constructed. Yet virtual bodies are not *necessarily* culturally marked by sex or gender in the same sense as organic embodiments.

Despite attempts to 'fix' identity and difference through assigning hierarchical and independent digital bodies, digital embodiment remains as unstable as everyday identities. In this sense, it seems that participants do not *necessarily* become 'other' in digital worlds. The silences and absence of talk about the signs of gendering, the construction of 'race' or other signs of 'embodying', indicate that people become 'self' in virtual worlds, both because of and despite digital markers of identity and difference. Participants' everyday material embodiments are carried over and not often challenged directly in the 'switching' of binary attributional categories. This is often because participants are sophisticated readers of 'virtualities' (Morse, 1997) and are familiar with reading other media as they perform gender in 'everyday life'. The binary system of boundary markers itself, however, is destabilised by the simultaneous inhabiting of programmed and nonprogrammed worlds. Extending the body into a technical system can render such a body vulnerable to these instabilities. In Don's case, for example, he both does and does not take up alternative forms of enacting gender. In the case of Cate, she consciously constructs her gendered embodiment in a digital world through generic signifiers. The degree to which participants are able to take up different positions, however, relies on the (multiple) institutionally supported discourses of gender and embodiment that participants encounter elsewhere, and that are (re)enacted through digital worlds. There was no satisfaction for Don in articulating his gender differently than he would 'usually', because there are no satisfactions provided by the digital world itself, nor the social world where the technical system is situated, to do so.

It is in this way that virtual bodies are 'cyborgs', hybrids who are potentially unfixed, changing and polymorphous. Human beings who engage in virtual realities simultaneously occupy both the physical, organic world, and the cyberspace of information. Virtual bodies therefore have the potential to *both* maintain *and* disrupt gender norms, boundaries and exclusive categories.

It seems that some contemporary digital/ material — virtual — bodies are a long way from the post-gender, feminised and feminist figures envisaged by Haraway. Some virtual worlds require our consent to what Schirmacher (1997:

68) calls 'the abstraction game', which prises signification from the conditions of its own production and support. In the most widely available worlds in commercial venues, participants seem to expect an embodied 'realism', based both in their particular embodied history, but a history already mediated by the generalised simulations of multiple media. This conforms most closely to what Baudrillard (1980, 1980a, 1996) describes as the effacement of the 'real' in simulation. This hyperreality is not constructed through the *suppression* of the real, but rather through its infinite elaboration in systems of signification, which finally become 'more real than the real'. Embodiment and the self in hyperreality is not coded through a denial of the body, but rather through the intensification of representation around it; that is, through potentially infinite signs, so intensively deployed, that they come to 'stand in for' the body and/ or self as referent. This movement is evident in the concentrated cluster of signs that code 'disembodiment', generated through a number of symbolic strategies. These include the differentiated bodies which position participants as 'strangely' embodied, to the stories which develop sometimes intricate fantasy worlds which have never existed, and contain impossible characters, to the generic bodies which render possible multiple and simultaneous codings of embodiment, to 'hypermasculinity' and the transcendental self of 'presence'.

Such 'overwritten' images and texts stop short of 'pure' hyperreality as Baurillard (1983) conceived it, however. Baurillard's (1980, 1983) analysis of signification²⁵ developed out of specific sites such as signification practices in advertising, television and theme parks. Because virtual systems do bear similarities to representation in these spheres, the analysis of hyperreality is appropriate. However, virtual realities as material systems have different qualities than other media which are elaborated through hyperreal sign systems. Regardless of how transparent the 'interface' is purported to be, the symbolic does not bypass the phenomenal. The material bodily histories of participants are brought to bear in the enactment of these worlds, which disrupts the enactment of a seamless system of signification. This is not to say that the physical or phenomenal are determinative of 'experience' through bodily action and will. Instead, they are coupled together in diverse ways in different virtual worlds and technical systems. The stories that participants told about their immersion in OSMOSE©, for example, allow for the layered and critical refusal of abstraction

into hyperreality through an awareness of both representation and what lies 'beyond' it.

Game and Metcalfe (1996: 140) argue that this process of meaning-making is one in which relations are socially embedded in the body.

[M]eaning is being *produced*, sensually, materially; meaning, *a* meaning, is not being transmitted-received directly. And it is not as if the body passively absorbs meaning, like a sponge; a physical-emotional response to a text implies an active relation ... our body works, our body reads ...

If our bodies are intimately connected to virtual systems, those connections make meanings about 'becoming virtual'. What the body does, how bodies agentially act in the world and how they 'write' social subjectivities is important to consider if we are to understand how identities and differences are worked and reworked in virtual systems. How the historical possibilities of fantastic cultural texts are being coupled with specific, material instances of technical systems is the subject to which I now want to turn.

‘Writing’ the Virtual:

Machines, (Inter)action and the Politics of Embodiment

As anyone who designs VR simulations knows, the specificities of our bodies matter in all kinds of ways, from determining the precise configurations of a VR interface to influencing the speed with which we can read a CRT screen. Far from being left behind when we enter cyberspace, our bodies are no less actively involved in the construction of virtuality than in the construction of real life.

N. Katherine Hayles *Embodied Virtuality*

They made a few final tests of their harnesses, both of which hung from the ceiling by an arrangement of straps and pulleys that would allow their users freedom of movement in VR, as well as prevent them from walking into real walls or hurting themselves with a fall. When the pulleys had hauled them aloft, they dangled side by side in the middle of the padded room like a pair of marionettes on the puppeteer’s day off.

Tad Williams *Otherland*

Cultural critics, virtual reality designers and science fiction writers all (implicitly or explicitly) acknowledge the inescapable reality of material embodiment in virtual reality technologies. Whereas some tend to treat these technologies as a tool, an ‘interface’ to a disembodied realm (thus leaving the ‘surfaces’ of ‘the body’ intact along with the consciousness of presence), others are beginning to question the *intervention* of such technologies in the social construction of embodiment. As James and Carkeek (1997) argue,

debates about virtual reality technologies are consumed with issues of the body.

As Bukatman (1993: 244) notes,

In contemporary fiction and philosophy the body has been successively — if not simultaneously — addicted to, infected by and wired into the cybernetic system. The imploded arenas of the datascape become the new phenomenal ground for bodily awareness. It is the experience of the body that operates to center the subject, which is why the body must serve as the interface with terminal reality ... So far, the body has remained largely protected, a boundary that might be transgressed, but a boundary and limit point nevertheless. Yet within these [cyberpunk] discourses, the body is hardly inviolate — it is instead a site of endless dissolution. From here the language of terminal identity becomes increasingly de-forming of the human, as the subject is simulated, morphed, modified, retooled, genetically engineered and even dissolved.

Virtual reality technologies ‘retool’ bodies through those processes whereby human bodies physically connect with virtual systems. Through various ‘interface’ devices, a cybernetic ‘feedback loop’ is formed (Hayles, 1996a),¹ in which each element of the technical system (including the human ones) adjust in an ongoing way with each other. The construction of these ‘feedback loops’ therefore entails social and cultural struggles at the boundaries of human embodiment, and is centrally concerned with the implications of intimately connecting organic human bodies with media and communication technologies.

Virtual reality systems often symbolically stand in for these ‘retooling’ processes in the near future scenarios of cyberpunk fiction.² These fictions, discussed in Chapters Two and Three, use both existing and imaginary virtual technologies as symbolic resources. William Gibson’s (1993a) *Virtual Light*, for example, projects contemporary VR technology into fiction by (only slightly) extrapolating current practice. In this novel about industrial espionage, a prototype of a new display system (essentially a head mounted display the size of a pair of sunglasses) is stolen along with the access codes in that system for exploring large chunks of the producer corporation’s data in cyberspace.³ While this kind of system does not exist, prototypes of the display elements are currently produced by companies such as Virtual i-o® (see Fig. 4-1).

In *Johnny Mnemonic* (1995), on the other hand, the central character enters ‘dataspace’ through both currently existing and currently imaginary devices. Johnny Mnemonic is a data carrier who accesses cyberspace to manipulate various forms of information which are his stock in trade.



Fig. 4-1
Virtual i-o i-glasses
Advertising Image
Courtesy of Virtual i-o ©

In the feature movie version of Gibson's (1993) short story, Johnny accesses cyberspace through the use of datagloves to manipulate information (existing technologies produced since the late 1980s, and storyboarded in Fig. 4-2).⁴ The use of a neurological implant in the same film, which connects the software to the user's brain and nervous system is, on the other hand, a purely imaginary construction.⁵ The 'real' and 'imaginary' devices are linked: Chapter Eight addresses how technical facts and fiction each contribute to VR artefacts in industry communities. The question that concerns me here, is about *how* virtual reality systems are materially configured, and how different systems have different implications for different bodies? How do people *use* virtual systems, and what stakes they are playing for?

When those who produce VR systems as artefacts discuss their material attributes, they often position them as 'interfaces' (Laurel, 1990, 1991). This has two implications for how embodiment in these systems is conceptualised. The first conceptualisation of VR as 'interface' is where the 'interface' itself is said to 'disappear', and the second is where technics are an instrumental tool separate from the body of its user.

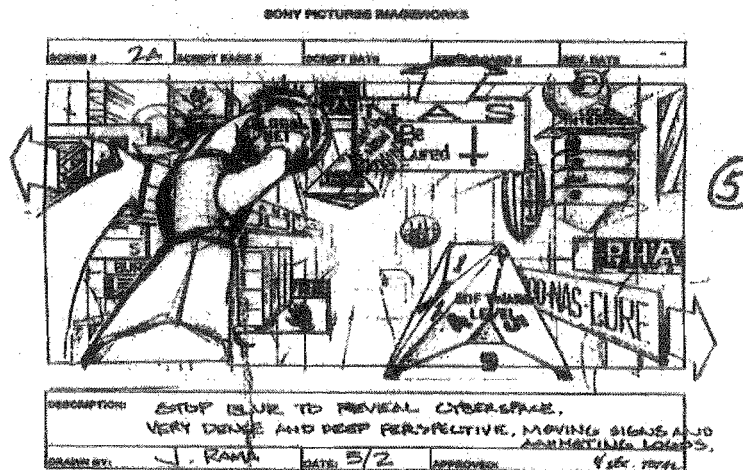


Fig. 4-2
Storyboard for *Johnny Mnemonic* with glove
© Sony Pictures Entertainment Ltd.
<http://www.spe.sony.com/movies/johnnymnemonic.htm>

The first way of describing virtual systems as ‘interfaces’ is to treat the ‘interface’ as if it ‘disappears’ — ‘because it is perceptually so immediate as to seem unmediated’ (Tenhaaf, 1996). Meredith Bricken (1991) argues that because one is immersed, there is ‘no interface to design’. The technical apparatus is thus considered physically ‘intuitive’: it becomes transparent because it is ‘enacted’ rather than ‘acted upon’. The material body is said to (at least conceptually) ‘disappear’ along with the physical interface. Thus, participation in technical systems is equated with the incorporation of the technical apparatus in/onto the human mind (body). If this is the case, then the unproblematic assumption of everyday modes of embodiment and identity is to be expected in virtual reality systems.

The second approach to virtual systems as ‘interfaces’ employs a conceptualisation of the machine as an instrumental tool. In this case, the human body remains coherent and is not de- or re- constructed by the object (Kendrick, 1996). In this approach, connecting with the technology instrumentally employs the ‘use value’ of the technical apparatus, which remains individuated from the body at the surface of the skin. Both of these conceptualisations assume, however, that the virtual system is a ‘neutral’ device (cf. Winner, 1980, 1986).

Another way of conceptualising the relation between human bodies and virtual systems is considering the system as an (albeit unstable) ‘feedback loop’ with organic and non-organic parts. This opens up questions of how machines and bodies are called into each other’s service in particular

locations. It addresses both the investments of everyday embodiment, and challenges to it. Just as the organic is inscribed into the machine through the design of movement/ interactivity (see Chapter Eight), so the machine inscribes its qualities in/ on to the bodies of participants. One experienced gamer described the process of inscription and the desires associated with it in this way:

Any gamer will judge the graphics, and the playability of a game by how sick they can get. So the more you puke, the more stars you get ... Granted you know, your average folks don't want to go in and get sick for a day ... but look at a roller coaster ... we'll get in line for roller coasters constantly — why? because they get that nauseous feeling they're going down the hill. If you can get that same experience, why not do that (Ben, Interview, San Francisco, March 1996).⁶

The physical, sensual and emotional aspects of practising virtual embodiment by being connected to technical systems makes meaning about that embodiment. Here, I begin to ask questions about how bodies and technical systems 'inscribe' or 'write' each other. Whose bodies are engaged in different systems, with what effects? What sorts of opportunities and constraints do such encounters offer for constructing embodiment? Drawing attention to the importance of material artefacts allows us to consider action and interaction in the processes of 'becoming virtual'. It positions socio-technical artefacts at the centre of analysis, and opens up questions about VR systems as technical and economic as well as cultural objects. This is not to argue that the qualities of physical objects *inevitably* produce certain 'effects',⁷ nor that technical systems are neutral grounds across which social relations are played. Rather, such questions interrogate how 'technology' is inextricably linked with 'the social' in socio-technical networks of practice across different sites (Grint and Woolgar, 1995).

In this chapter I ask questions about the *particularity* of devices which comprise virtual reality technologies, and the particularity of their effects (how systems come to take the particular forms they do will be discussed in Section Four on 'Building the Virtual'). As Balsamo (1996: 126) notes, 'although the body may disappear representationally in virtual worlds — indeed, we may go to great lengths to repress it and erase its referential traces — it does not disappear materially in the interface with the VR apparatus or, for that matter, in the phenomenological frame of the user.' What modes of physical interface are available in different virtual systems? What modes of action and interaction do such interfaces make available, and what are the

implications of these modes of action for disrupting the notions of body and self explored in Chapter Three? Such questions address how the physical aspects of participation in VR might support or disrupt the ‘identity readings’ of virtual worlds as texts.

To address these questions, I examine material and bodily aspects of connection to the virtual systems I discussed in Chapter Three. Throughout the previous chapter I treated ‘subjectivity’ as a matter of ‘reading’ the boundaries of the software, digital texts, as cyberspaces. The ethnographic stories that emerged in Chapter Three, however, stressed the overwhelming assumption of everyday bodies and selves (the often unproblematic assumption of an ‘I’) without necessary (narrative) recourse to markers of embodiment in practices of digital representation. Ethnographic stories made plain that it is impossible to treat representation as if its thread could be unravelled from those of bodily action, ‘interactivity’ and being in the (physical as well as textual) world. The construction of identity and difference is not merely a matter of reading virtual worlds as stories: it is also a matter of physically constructing a sense of ‘presence’ ‘action’ and ‘interaction’ in such worlds. Here, I want to turn to how the physical agencies enabled and constrained in the practice of virtual reality technologies have implications for meaning about body, self, identity and difference. What is constrained and enabled is a matter of both knowledge and power, and the articulations between them in particular sets of organisation, institutional forms, and interpersonal relationships. Opening up a phenomenology of VR through ethnographic stories is one way into questions about how power works through physical artefacts, and the production and consumption of virtual realities as technical systems, as well as digital worlds.

Constructing Modes of Digital Embodiment

‘This is a very basic setup — that is, your interface equipment, the goggles and sensors you just put on, are not very advanced. But even with what we have, this looks like water, does it not? Moves like water?’

IXabbu bent and ran his gray fingers through the pool. ‘It flows a little strangely.’

‘Money and time make it more realistic. There are external simulation rigs so well made that not only would this move just like real water, but you would feel it, cold and wet on your skin ...’

‘But it would not quench my thirst, would it? If I did not drink real water I would die.’

You would indeed. It’s a good thing to remember ...’

Tad Williams *Otherland*

In both the fiction of 'Other lands', and the social organisation of virtual reality technologies, the importance of physical activity and sensation for constructing embodiment in virtual worlds is well recognised. Systems of bodily gesture and action constitute a phenomenology of socio-technical relations in virtual reality systems. Meaning about and practices of embodiment, as well as relations of identity and difference, emerge from phenomenological interaction with digital worlds and concrete artefacts.

The enactment of digital embodiment in virtual worlds constitutes a range of practices which redefine what *counts* as embodiment in technologically mediated cultures, and how that is achieved in local contexts. Such local practices are intimately connected to wider networks of collective life within, for example, 'cultures'. The everyday 'habitus' of the body (Bourdieu, 1989) entails specific kinds of collective knowledge about and practices of embodiment. 'Habitus' is formed through the embedded organisation of social, economic cultural and symbolic capital, as these are worked through micro-social enactments of physical and cultural production and reproduction (Turner, 1994). Bourdieu characterises 'habitus' as 'both a system of schemes of production of practices and a system of perception and appreciation of practices ... thus ... a "sense of one's place" but also a "sense of the place of others"' (1989: 19). Such 'distinctions' (1979), often cast as a matter of cultural 'taste', are actually detailed, (physical, cultural and symbolic) mutually reciprocal categorisations of social subjects. For these 'recognitions' of self, others, practices and objects to take place, such relations are institutionalised in 'fields' of everyday life. '[T]here have to be stakes and people prepared to play the game' (Bourdieu, 1976: 72).

Bodily disciplines are central in the practices of 'habitus'. Local disciplinary practices of physical production and reproduction constrain some kinds of bodily attributes and identifications, and enable others. The notion of discipline as Foucault (1973, 1979) used it described techniques of the body (and technologies) as a form individual and collective control of populations. Whereas the governance of populations was historically enacted through physical force and centralised surveillance,⁸ 'discipline' instead employs not only *consent*, but the *desires* of the individual in disciplinary operations at the level of the (conscious and unconscious) bodily activity of the organism itself. According to Foucault (1979: 136-137), these disciplinary mechanisms can be characterised as a set of practices which do not treat the body

en masse, 'wholesale', as if it were an indissociable unity, but of working it 'retail', individually; of exercising upon it a subtle coercion, of obtaining holds upon it at the level of the mechanism itself — movements, gestures, attitudes, rapidity: an infinitesimal power over the active body.

Rouse (1994: 95) notes that whereas other exercises of power can destroy the body, this discipline and training 'can reconstruct it to produce new gestures, actions, habits and skills, and ultimately new kinds of people.'

Disciplinary pleasures are predicated on the 'naturalisation' of particular bodily habits and gestures, no less in virtual reality technologies, than in other social worlds. Anne Balsamo (1996: 124-125), for example, talks about the ease with which she enters a virtual space. While she talks about disconcerting elements — shifts in perspective and point of view, orientation in space (considered in Chapter Three) — she also describes her time in the virtual world as uneventful, and wonders at the way that the suppression of her body becomes 'technologically naturalised.'

The sense of 'reality' or 'naturalness' in the construction of 'the virtual subject' is organised around techniques familiar to bodies living in highly technological societies. Bodily techniques are already *learned* (often unconsciously) over a lifetime of living in highly technical, highly mediated cultures. Technologically mediated relationships are translated and written into the body as bodily, subjectively defined competencies. These 'techniques of the body' (Mauss, 1973; Lyon, 1997) are comprised of bodily gestures, actions, behaviours, and habits which create 'ensembles' — physical, symbolic and subjective assemblages — which are simultaneously biological, cognitive and social/ cultural in nature, and 'aim to render the individual both more powerful, productive, useful *and* docile' (Sawicki, 1991: 67). The construction of virtual realities draw on these social assemblages to construct a virtual system which assumes or promotes some competencies over others.

Just as disciplines reconfigure the body at an intimate level, in doing so they operate to reconfigure subjectivity through the construction and operation of *desire*. According to Sawicki (1991: 67-68),

[d]isciplinary practices ... are located within institutions ... but also at the microlevel of society in the everyday activities and habits of individuals. They secure their hold not through the threat of violence or force, but rather by creating desires, attaching individuals to specific identities, and establishing norms against which individuals and their behaviours and bodies are judged and against which they police themselves.

The desire for *identity* with others incites the desire to maintain self *surveillance* and self correction to norms. According to Foucault (1977: 155), 'there is no need for arms, physical violence ... Just a gaze. An inspecting gaze, a gaze which each individual under its weight will end by interiorising to the point that he [sic] is his own overseer, each individual thus exercising this surveillance over, and against himself.' Discipline becomes *self-disciplines* — the *self-discipline* required to give oneself over to the cybernetic feedback loop, and the *self-surveillance* required to remain connected to that system most 'effectively' and 'efficiently'.

Crandall (1998) describes just such mechanisms in his account of exercise machines:

Here the body sandwiches itself into a machine, pressed against a smooth contoured surface that has been moulded to couple with it, holding it rigid. Securely in place, joints aligned, attention and orientation adjusted, it performs precise, prescribed movements along optimized ranges of motion, internalizing a rhythm of repetition that becomes nearly habitual ... Through the conduit of image, enforced temporality, body and machine, one changes the very contour of the flesh, simultaneously downloading and internalizing the image while uploading the body into the realm of representation ... The machine is optimized according to certain values and norms, coupled with the body in the interests of [pleasure] ... The image makes the body fit to see it; it makes the body adequate to its frequencies ... This inseparable body-machine-image complex, as an apparatus of exercise, habituation, sedimentation, transformation, is intextricably involved in a 'setting into motion'...

Feminist poststructuralist scholars in particular have drawn attention to the ways in which disciplinary practices are both highly *gendered*, and a central mechanism which produce *gendering* (McNay, 1992; Bordo, 1989; Bartky, 1988). Gendering is *achieved* through the effects of gender-differentiated disciplinary mechanisms (and resistance to them) on already gender differentiated bodies.

One striking example of the differential effects of disciplinary technologies on the regulation of the body is presented by *Ms.* magazine (1994) (see Fig. 4-3). In this advertising image, a body carrying some of the conventional markers of femininity (long hair, face shape, skin tone) is bound down/penetrated by a technical apparatus which completely covers her eyes and mouth. The advertisement is for a facsimile machine, and the accompanying text to the image reads: 'If it was any faster, you would have to send and receive your faxes internally.'

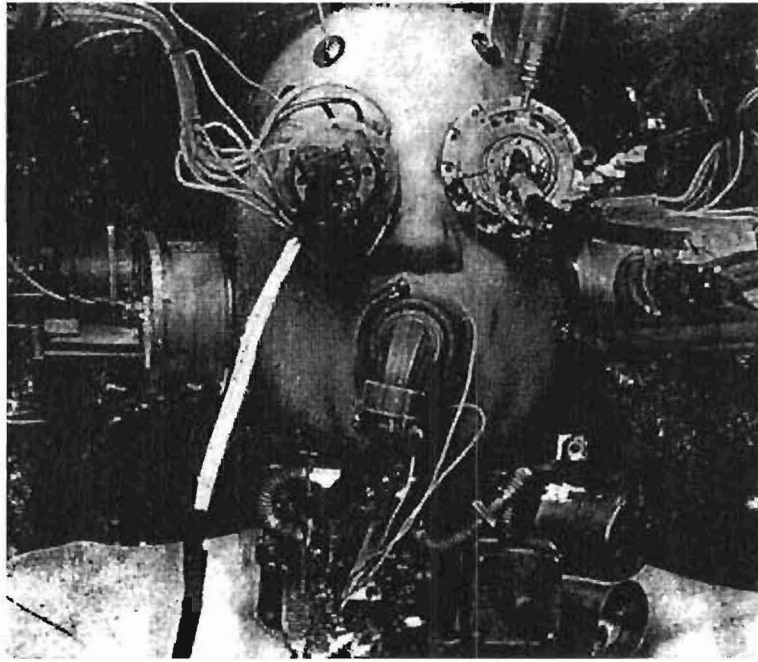


Fig. 4-3
Facsimile Advertisement
Ms. magazine (1994), back cover
© *Ms. magazine*

An image like this might, for a cyberpunk community, signify the redefinition and expansion of the human body by computing technologies: a cause for celebration. Instead, *Ms Magazine* reads this image in its particularity — as a representation of a *woman's* body. They suggest that its semiotic conventions draw from pornography. Women's means of subjective expression in the world — her ability to see and to speak, to have voice — are erased in this image, just as they often are in pornographic images. The technical apparatus physically closes off her eyes and her mouth. She has become an object for the technology.

In the case of virtual reality technologies, the cover of *Virtual Reality and the Exploration of Cyberspace* (Hamit, 1993) represents the head of a woman rendered as a spiralling hollow strip (see Fig. 4-4). On the 'outside' of the strip are conventional markers of (white) femininity, including chunky earrings, and heavily made-up eyes and mouth: in this case, the eyes and mouth of the woman are the features that can be seen clearly. On the reverse side of the 'strip' is the representation of computer circuit boards. The overall effect is one of the woman's head and face becoming both 'hollow' and 'mutable' by the agency of technical systems. Her head is bodiless. She has no 'inside': she is all 'surface'.

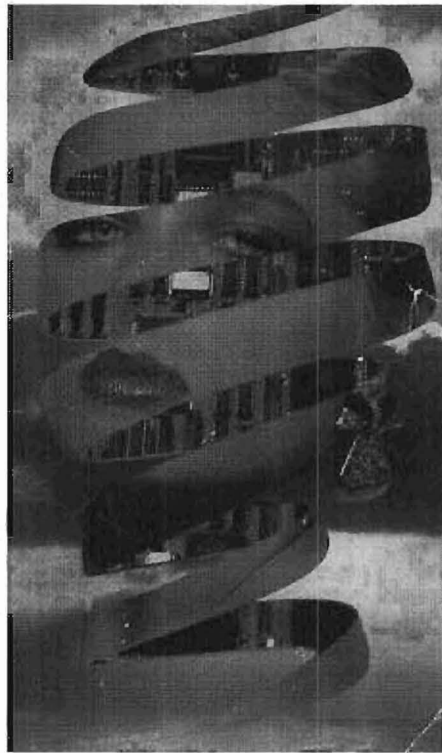


Fig. 4-4
*Virtual Reality and the
 Exploration of Cyberspace*
 Hamit (1993), front cover
 © Sams Publishing

These are just some of the ways in which technical apparatuses become gendered, and produce gender. The analysis of the association between technologies and women as objects of desire has become commonplace in gender analysis (see, for example, Fuchs, 1993; Springer, 1991). My intention here is not to argue that women's association with technologies are *necessarily* sexualised or objectified. Rather, my interest is to explore the persistence of these cultural tropes despite the possibilities of alternatives. I am interested in how virtual reality technologies are implicated in such representations, but also how those representations are intimately connected with the ways that technical systems are lived — prosthetics matter (Stone, 1996). The 'posthuman' (Halberstam and Livingston, 1995) does not mean that gender is erased, nor are these images the only means by which women are represented in relation to technology. Rather, gendered bodily activities are enabled and/or constrained by the apparatus which has to fit to particular bodies, and how assumptions about gender are inscribed through the machines.

Bodies in virtual reality technologies therefore become sites of struggle for competing forms of control, a control which works at the level of, and on, the body. I want now to turn to how such assemblages of subjective embodiment are carried out via a phenomenology of the actions and interactions of the 'virtual' body in local VR sties.

Disciplinary Strategies

The socio-epistemic mechanism by which bodies mean is undergoing a deep restructuring in the latter part of the twentieth century, finally fulfilling the furthest extent of the isolation of those bodies through which its domination is authorized and secured.

Allucquere Roseanne Stone *Will the Real Body Please Stand Up?*

Zoe Sofia (1992, 1995) argues that there are a number of ways to conceptualise the phenomenological relations between humans and technologies. Sofia (1995) conceptualises different 'aspects' of human/technology relations. Drawing on the work of Don Ihde (1990), Sofia (1995) proposes four categories of relations between human bodies and technological systems. 'Alterity relations' (also addressed by Turkle, 1984) refer to relations where the systems and the objects constituting them are things-in-themselves with 'quasi-human' properties (as is the case where people 'name' their personal computers). 'Background relations' are where technologies constitute a 'world', even if only temporarily (and in VR, these are the digital worlds explored in Chapter Three). Arguably, virtual reality technologies are the most extreme of background relations, as they temporarily constitute a world.

Hermeneutic relations are the signficatory or textual relations of technology, where tools and techniques can become interpretive vehicles for comprehending the world. Sofia (1995) argues that a map or a fuel gauge are two such technologies. In VR, one hermeneutic relation is in the interpretations of digital worlds discussed in Chapter Three. Another is one where the machine system itself becomes an iconic sign. The physical form of the machine signifies both what it does, but also what it *is*. The artefacts such as the headset become iconic of virtual worlds in general. In this sense, the visibility of the non-human elements of the technological system inscribes meaning around virtual experiences as digital 'otherness', a world 'framed off' from the everyday, and the technical as a *rite de passage* (Tomas, 1991)

or boundary point, which takes a participant from a world in which they are materially embodied to one in which they are digitally embodied. In Chapter Five, I discuss how the material components of VR systems built for entertainment are 'high-tech' forms. Virtuality® 'pods' have sleek surfaces, industrial plastic casings in black, computer cables and wires in obvious places, and embody the dominant ideal of how advanced technology should look and feel.

Finally, the feedback mechanisms through which virtual reality technologies operate make digital realities strong in what Sofia (1995) calls embodiment relations, where technology is a tool or technique which extends organs or senses in mediated ways. In Chapter Three we saw how digital representations can be rendered problematic via disjunctures between technologies-as-texts and the bodily reading histories of participants. Embodiment relations are both created and rendered problematic when technologies-as-artefacts meet the already constituted bodily desires and disciplines of participants. In VR, these embodiment relations are expressed in the concept of 'presence'.

In Chapter Three, I discussed the construction of 'presence' and 'immersion' via representation in a digital world, and foreshadowed my discussion here of the importance of 'point of view' for constructing a sense of 'presence'. The concept of 'presence',⁹ as used by computer scientists and engineers, is most often used to describe those elements of perception and interpretation which combine to produce a three dimensional and perspectival impression of representations in a virtual world through a point of view and the assignation of a body, the subjective interpretation of these processes as 'being', and the 'testing' of that interpretation through measures of goal-oriented activity. Some computer scientists argue that 'having' a body is an important component of a feeling of 'presence' (Slater and Usoh, 1994, 1994a). Others, such as Jon Waldern of Virtuality®, disagree. When I asked Waldern whether 'having' a body is necessary for immersion in a digital world, he argued that it is not at all necessary to have body to have a 'self'. Comments from participants indicate that the sudden 'disappearance' of one's body is not at all disarming. They matter-of-factly described the disappearance of their body in Sega® Netmerc, for example (Interview, Auckland, November 1996).

(Nic) Did you notice what you look like in there ?

(Woman) No, there was just bullets coming out of the screen.

(Man) Oh, you can only see in front of you... you can't see yourself...

I will discuss in Chapter Eight how programmers decide to embody (or not) a participant figure in design decision-making. Whether a body is assigned or not, however, all virtual worlds operate by the imposition of a point of view and modes of 'interaction' which position individuals as 'present' in that world.¹⁰ While computer scientists draw on a number of indicators to measure 'presence' as a human factors issue, Sandy Stone (1995: 400) argues that the notion of presence as a cultural concept forms the foundation of both authority and agency. In historical logics of governance (such as monarchy), embodied physical presence was initially required for state authority, progressively replaced by the physical presence of a delegate or prosthetic object (such as the bureaucratic 'paper trail' which warrants identity). More recently, warranting presence (identity, agency, authority) has become problematic as collective entities become more fragmented and multiple. Like street addresses or psychological profiles, a presence in a virtual world serves to 'fix' an identity in place, to attribute authority and agency in a digital world by assigning particular characteristics to the enactment of 'agency'. These characteristics serve both to enable, and to limit, what is possible for participants in a virtual world. 'Presence' is therefore a matter of 'passing' in technical contexts, as much as it is 'acting' in digital worlds (Rachel, 1994).

The similarities between technical systems produces some congruency amongst presence in virtual worlds, such as point of view. Access to the visual images of a virtual world takes place through a Head Mounted Display (HMD). The head mounted display places boundaries on what participants can see and hear (and which one cannot move beyond) by insulating the user from the 'outside' world, and subsuming the sense of their material body to the governing logics of the digital/ visual feedback loop. This constrains possibilities for seeing and exploring a virtual world. The point of view further structures possible forms of interpretation of, and action in, that world.

The ways that a point of view is constructed is one of the central mechanisms evoking a sense of presence, being and immersion in virtual worlds, and a first person point of view is common amongst all of the virtual realities I consider in this thesis.¹¹ Sega® Netmerc is a good example of the way embodiment is constructed almost entirely through a point of view. It uses the conventions of first person visual perception and the movement of graphics to represent motion, and constructs scenarios of 'flying' through tunnels and 'driving' through streets. One participant's depiction of the world

in this game, which demonstrates the perspectival point of view which structures the world, is depicted in Fig. 4-5.

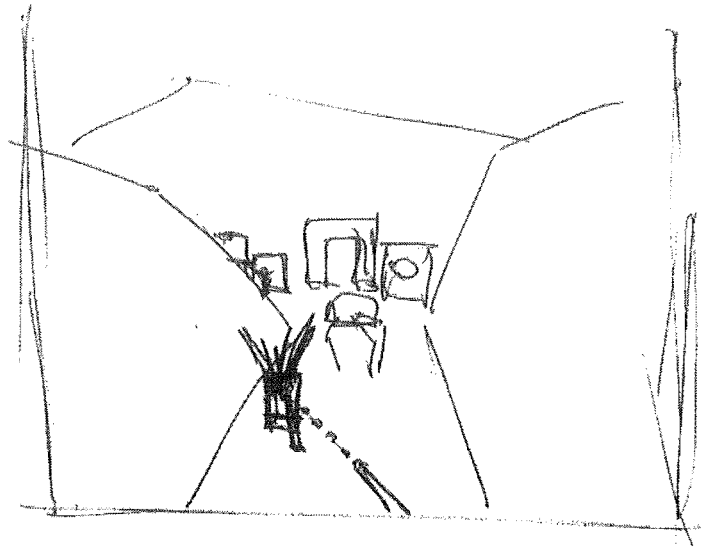


Fig. 4-5
One Participant's perspective
in Sega® Netmerc

This 'point of view' is not an unfamiliar mode of looking. 'Point of view' is well known through techniques in art, film and television, and as such is a familiar discipline of seeing. Specifically, the development of perspectival representation, and of a tradition of 'realism', which assumes representation as a reflection of a pre-given reality, enable particular kinds of perception, representation and interpretation, and constrain others. Doug Faxon, a virtual worlds designer, argues that

[Engineers and programmers] see virtual worlds as an extension of this world, as ... a way to simulate something for practical reasons. My overall perception ... is that they're very concerned with practical reasons for doing it and are not concerned with any kind of artistic sensibilities ... They want to create things that make the real world a better place and ... in a very practical way. I want to create things and make the real world a better place by putting us in head spaces that we may not have ever been in before and give us a way, a new way to appreciate the world in which we live (Doug, Interview, Santa Rosa, September 1996).

Perspective and point of view in fact *construct* reality in non-programmed as well as programmed worlds. As de Certeau (1986: 208) notes, '[r]epresentations are authorized to speak in the name of the "real" only if they are successful in obliterating any memory of the conditions under which

they were produced.⁷ Technical mediation and changing systems of image (re)production have shifted conventions of image making and representation, and have thus shifted the embodiment of visual perception and ways of constructing meaning from signs (see Classon, 1997).

Overwhelmingly, participants are already familiar with these conventions in visual media. The physical acts of looking and seeing are already socially mediated (and historically and culturally specific) activities, and employ familiar bodily competencies. Photography, film, television and video, for example, have contributed to a popular familiarity with lenses and screens. Having screens in front of the eyes is but a small step from sitting in front of other kinds of screens, be they the small domestic variety (whether these are television, HDTV or personal computer screens), or the large public variety (film screens and/ or public display televisions, or IMAX). Increasingly, people have also learnt to decipher different images projected simultaneously on a number of screens at once, very close together. Moving from the ability to read these images, to the ability to focus on and physically perceive images that are at most 5 cm in front of one's eyes is not a large step. The people with whom I spoke often specifically used comparisons between VR and other media to describe their experiences of connecting with technologies.

Berger (1974: 10) notes that 'every image embodies a way of seeing', and that the very perception of images shifts historically in relation to the ways in which images are socially produced and situated. According to Berger (1974), seeing comes before words in the ways that we situate ourselves in relation to our world, and relations of the visible are culturally specific (Grosz, 1994) and contextual (Merleau-Ponty, 1962). Western history has privileged the visual as a means of perceiving the world (Nast and Kobayashi, 1996; Crary, 1990). This ideal is masculinised (Classon, 1997). In western societies, the Renaissance produced a shift to the conventions of perspective in image making, which, according to Berger (1974: 16, emphasis in original),

centres everything on the eye of the beholder. It is like a beam from a lighthouse — only instead of light travelling outwards, appearances travel in. The conventions called those appearances *reality*. Perspective makes the single eye the centre of the visible world. Everything converges on to the eye as to the vanishing point of infinity. The visible world is arranged for the spectator as the universe was once thought to be arranged for God.

According to the convention of perspective there is no visual reciprocity.¹²

The participant becomes the centre of the world under construction — for all intents and purposes the world is what the participants see in it (see Fig. 4-6 as an image depicting the importance of vision in virtual reality technologies).

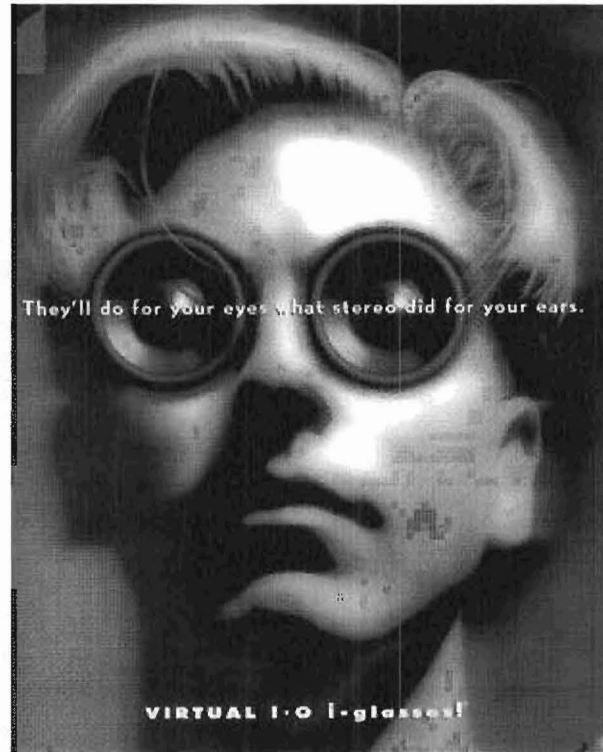


Fig. 4-6
The dominance of vision in VR
Mondo 2000 (1995) Back Cover
© Mondo 2000

Virtual realities utilise this form of perspective to produce an ‘Eye/I’ (Kondo, 1990: 3), the looking, seeing, observing western subject, a subject whose observation masters and controls that world. According to Hayles (1996: 14),

[t]he cultural constructions that identify masculine subjectivity with the mind, female subjectivity with embodiment, may be responsible for actual physical differences in how men and women react to immersion in VR. When a user enters a VR simulation, body boundaries become ambiguous. Body motions affect what happens in the simulation, so that one both is and is not present in the body and in the simulation. The body marks one kind of presence; the point of view, or pov, that constructs the users position within the simulation marks another.

The ‘Eye/I’ is the also the subject of (self and other) surveillance, delineated by Foucault (1979). Specific and socially structured techniques of looking and seeing (a ‘reality’ in Berger and Luckmann’s (1967) sense), make it

possible to employ the 'gaze' as a means of social regulation. This manoeuvre effectively suppresses the non-digital world in which participants are simultaneously located. Structuring 'ways of seeing' in this way tends to reinforce the notion that VR is a tool which offers limitless digital freedoms without recourse to the body.

A 'disembodied' presence then, creates a central *tension* in the drive to create VR that is 'being there'. This paradox is that a technology which claims to simulate material embodiment digitally (and attempts to do so 'objectively'), does so through means of engaging the competencies of the bodies it seeks to erase. This position entails the simultaneous *suppression* and *discipline* of the material body (and its non-digital contexts) to the bio-apparatus which enables virtual worlds, and its simultaneous *incorporation* into a technical system which generates digital worlds. Furthermore, generating a gaze dissociated from a body positions the subject as spatially unfixed, therefore rendering the subject more manipulable, more open to discipline and normalisation, more subject to the circulation of signification and value in production and consumption (Nast and Kobayashi, 1996: 79). Immersion and presence are therefore about the extent to which the human fits into the cybernetically conceived feedback loop which creates a microworld (Hayles, 1997). It creates, in Tomas' (1995: 258) phrasing, a 'body in the image of technology.'

Different technological systems that I explored provided different points of view which were more or less 'disembodied' or 'transcendental' in the sense described above. When I visited Doug Faxon, a 'garage' VR builder, for example, the model of his childhood family home (that he had built for his family to experience) could be viewed from a number of different positions.¹³ Many of them seemed to me to be particularly 'disembodied', floating as they did through rooms without reference to an embodied ground. For Doug, however, the point of view had meaning with regard to his personal history associated with looking at this place. For him, therefore, the views were highly embodied and 'immanent'. Another world that Doug wrote *played* with the conventions of point of view, perspective and space, and the traditions of artistic realism. Doug constructed a digital 'Escherworld', which drew inspiration from Maurits Cornelis Escher's paintings, with rooms filled with stairs infinitely turning in every (three dimensional) direction in a series of rooms. Doug envisaged this as a meeting place for himself and friends. Effectively, the world challenges a sense of objective perspective and

realism, at the same time as it employs the potentially ‘disembodying’ conventions of first person point of view.

This is no less true in the case of OSMOSE©. OSMOSE© evokes quite a different sense of presence from systems such as Virtuality® or Sega® Netmerc, even as it utilises a first person point of view in its display of its worlds. This is because other elements of ‘looped’ systems subvert the transcendental point of view. While OSMOSE© uses a HMD, it also uses a breathing vest which enables movement in the world (see Fig. 4-7)(see discussion below on action and interactivity). While the artist herself (1995) argues that head mount technology tends to privilege the masterful and controlling gaze (and while OSMOSE© also seeks a sense of ‘transcendence’ through this — see Davies’ quote below), Osmose also utilises the ambiguities produced by different hardware in critique of the ‘realism’ which has historically emerged from traditions of film and photographic image-making.



Fig. 4-7
OSMOSE© Breathing Vest
<http://www.softimage.com/projects/OSMOSE>
OSMOSE: Author Char Davies
© (1995) Softimage Inc. All rights reserved.

‘Realist’ traditions construct the *signs* of ‘reality’, and attempt to do so through effacing the mediated nature of those signs. Traditions of realism in virtual reality technologies mimic the ‘realism’ of other media such as television (Wark, 1994) or ‘information’ technologies (Baudrillard, 1980a),

which in fact produce simulations (Baudrillard, 1983). As a (quite self-conscious and, in some senses, ironic) critique of this 'hyperreality', Char Davies aligns herself with an evocative, ambiguous and luminous style (which emerged from her painting and her own embodied, myopic vision), and against a 'hard edged photo-realism' which tends to produce a controlling and masterful gaze.¹⁴

In OSMOSE©, Davies attempts to shift the masterful gaze through the ways that the hardware and the software work together to produce the visual 'output' which constructs the multiple points of view in the work. In OSMOSE©, the focus is on transparency and ambiguity. Rather than becoming the centre of action, the gaze 'floats', suspended. Davies' (1995: 3) intentions about bodily sensation in OSMOSE© are instructive:

Simply stated, OSMOSE© is about *being-in-the-world* in its most profound sense, i.e. our subjective experience as sentient, embodied, incarnate, living beings embedded in enveloping flowing space. Osmosis: a biological process involving passage from one side of a membrane to another. *Osmosis as metaphor: transcendence of difference through mutual absorption, dissolution of boundaries between inner and outer, inter-mingling of self and world.* OSMOSE© as an artwork is motivated by the desire to heal the Cartesian split between mind/body, subject/object, which has shaped our cultural values and contributed to our dominating stance towards (and estrangement from) life. In this context, OSMOSE© seeks to *re-sensitize* - reconnecting mind, body and world.

As Davies and Harrison (1997: 7) note, the particularities of this system prompt participants to experience sensations that involve an 'altered mind/body state':

In this state, it seems they paradoxically feel both disembodied (because of the visual aesthetic, being able to float and pass through things) and embodied (due to reliance on breath and balance), simultaneously.

OSMOSE© therefore negotiates a position between the transcendence and suppression of the body indicated in the use of a bodiless gaze, and a position which simultaneously refers a sense of presence back to a participant's body, as edges of self and other are rendered ambiguous. OSMOSE© plays with a phenomenology of proprioception — a sense of the connectedness amongst parts of the body in space (Sacks, 1985), and the connections amongst senses, which are often disrupted in virtual worlds which cannot simulate all senses. As one participant (in Davies, 1995a) said of these sensual and perspectival confusions:

It was really like skin-diving, like I was floating in the water. But there was something very strange about the sensation, it was something more than skin-diving ... it was like I was in this kind of large space that kept shrinking and getting bigger again. Feeling like there's something natural about it and yet something unnatural about it as well.

This floating, hovering gaze confuses boundaries of 'self' and 'other'. Participants on the website (<http://www.softimage.com/projects/osmose>) commented specifically on the qualities of the technical system as a phenomenological object in providing a particular sensibility via the floating gaze:

'This is the most wonderful piece I have ever seen ... As opposed to most VR installations, this one is very relaxing. Actually, I cannot remember any other situation where technology was that relaxing or relaxing at all. Thank you for showing us this new side of high tech, one where we forget the technology behind it.' J.F.B

'This is a beautiful, significant step in VR. It is rare that interface, aesthetics and vision can come together as they have here — you have given the participants a wonderful experience.' MJ

In the case of OSMOSE©, virtual reality technologies are 'horizontal instances' (Sofia, 1995) of technologies which push the boundaries of technology/ body relations to the point where the limits of each become indistinct. A technology or tool as a prosthetic becomes 'the body' in important ways, and the boundaries between a notion of an individuated organic body and a set of technical artefacts become blurred. This adds to the considerable ambiguity of negotiating embodiment in which both digital and material activities (and interpretations of them) conspire to construct an ambiguous form of embodiment: The human participant is both digitally and materially 'present' in both digital and material worlds (Hayles, 1996). OSMOSE© demonstrates forcibly that a point of view is not the only contributing element of immersion or 'presence in a digital world — how one can move, or act in a digital world, is also central.

Practices of Action and Interaction

The bodily qualities written into the software which code digital bodies attribute to those bodies a range of available modes of 'being' and 'acting', and inform how the relationship between information and materiality is

negotiated when people participate in virtual worlds. On the one hand, the graphics of HMDs and the forms of embodiment and action made available in digital worlds reproduce *familiar* schemes of spatiality and embodiment in material worlds. One is assigned a point of view which is oriented in three dimensional space according to notions of up/ down, forward/ back, inside/ outside, self/ other already integrated in bodily movement in everyday life. In one sense, the reinstitution of these bodily orientations is congruent with the notion of 'disembodiment', the separation of 'mind' and 'body', with the body as a 'vehicle' for the explorations of an individuated, coherent, autonomous and rational mind/ self. In another sense, the re-imposition of three-dimensional spatiality refers participants back to the far more messy and everyday constitution of embodiment — and the 'undecidability' of boundaries between mind and body in those modes of embodiment. The surfaces of each digital object in a programmable world provide points for the formation of discernible objects and spaces in thoroughly 'organic' ways.

A sense of 'presence' emerges not only from how a point of view is oriented three dimensionally in a world, but also from the work digital bodies can 'do' when they are assigned in the world. If one can 'interact', *perform* in a digital world, then one is 'there'. Julia noted the importance of movement and of 'doing' to a sense of being in a world.

I found too once I got going, like when I really got into it and I was standing there concentrating, I was moving... you know, you're more in the thing, like you're in there... (Julia, Interview, Auckland, November 1996).

Virtual world designers can make specific assumptions about the modes of action and interaction that are attractive or desirable for participants:

People [are] ... used to being passive. So if you're going to interest someone in a virtual world, they're going to be a bit stand-backish, they're ... not going to go in there straight away and start interacting and really, really explore... I think they'll, well, "take me for a ride, maybe, well I'll change a few things". They won't want to get in there too much, "maybe just entertain me, I want to sit back a wee bit. I'll interact if I want to, but don't force me to interact" (Stu, Interview, Christchurch, July 1995).

While I want to take up the frameworks and assumptions that virtual reality builders use to construct their audiences/ participants in Section Four, it is worth noting here that as in the case of perspective and presence, possible action and interaction in virtual reality technologies are (almost) completely determined by the parameters of the hardware and software provided. The

cultural understandings of self and agency employed to *create* interaction in a virtual world in large part determine the range of *engagements* possible.

Dactyl Nightmare™ combines specific bodily qualities and perspectives in digital space through which players can understand their embodiment there as ‘disembodied’. One game scenario, for example, is a ‘hit’ on another player. Another is receiving a ‘hit’ on your own body from other players. A third is being picked up by the pterodactyl, taken to a great height and then dropped. In each instance, the digital body flies apart in polyhedral pieces, and is more or less immediately reconstituted in a different location. My fieldnotes reflect my confusion and disorientation when this first happened to me:

I was moving across the floor, when all of a sudden, the world turned very quickly. The board receded underneath me, then everything went completely topsy turvy. I felt slightly nauseated from the speeding, gyrating images before my eyes. The movement suddenly stopped, and I was hovering away above the board without my body, suddenly a peculiarly disembodied actor in this game. Of an instant I was tumbling again, and then just as suddenly was back on the floor of the game board ... Perhaps the programme had a glitch somewhere along the line? (Fieldnotes, Auckland, January 1995).

When picked up by the pterodactyl, the player’s point of view suddenly switches from being digitally ‘embodied’ through mechanisms of perspective, to a point of view as if ‘suspended’ high above the field of play, a consciousness separated from a digital embodiment, watching the pterodactyl fly high with his/her virtual body. The point of view changes again when ‘their’ body is ‘dropped’, the visuals suddenly tumbling around until the body hits the game board, when the congruence of body and embodied perspective is reconstituted once more in a different location. Some participants indicated to me that they do not understand this process at all when they are playing the game, and it is only when they watch another playing, and see the action in the game through visuals which monitor the game play, that they understand what the scenario is, and therefore interpret their embodiment.

These techniques code disembodiment in opposition to more everyday material embodiments by representing modes of bodily action impossible in everyday life, and thereby underscoring the otherness of digitally embodied experiences. If these bodily qualities are combined with a feeling of ‘being there’ (rather than ‘being here’), a sense of being digitally embodied (through the suppression of being materially embodied) results for participants. One game player claimed that

If you had great software along with the immersive feeling, that obviously ... that's the best case scenario. You're there. Dactyl Nightmare had horrible software in terms of the graphics but the immersion ... They did such a good job with the immersion that it worked out (Ben, Interview, San Francisco, March 1996).

The understanding and enactment of immersion is generated through the marketing of VR (see Chapters Six and Seven), as well as through a player's familiarity with other video game genres, and their experience of non-immersive virtual worlds (such as Virtual Worlds systems).¹⁵ I want to take up the issue of marketing in Chapters Six and Seven — how action is used in advertising Virtuality®, for example (see Fig. 4-8 for a typical 'action' advertisement for Virtuality®'s games).



Fig. 4-8
Virtuality® action
Virtuality® (1993) p. 18
© Virtuality® Ltd.

Here, it is sufficient to note that the cultural positioning of 'presence' is not limited to interaction with the machine, but is informed both by what

participants bring to that experience, and by how that interaction is embedded in wider social discourses and contexts such as how VR experiences are sold to publics (see Chapters Five and Six).

The techniques of immersion employ tacit knowledge to make them effective. Individuals carry what Polyani (1958) calls a ‘personal’ or ‘tacit’ knowledge which they bring to perception, language and symbolism, and relational/ interpersonal social worlds. That is, learning one’s perceptual, cognitive and cultural embodiment is the process of accumulating and continually modifying sets of tacit knowledges and practices which remain assumed in continually shifting experiential contexts. This notion of ‘tacit knowledge’ is useful when considering the ways that individuals make sense of virtual realities, both as stories and as technical artefacts. Individuals bring tacit knowledges, and their experiences of machine/ technology disciplines to their participation in immersive virtual realities, while at the same time reworking these assumptions on the basis of different kinds of — and collectively engendered — experiences.

The mechanisms of available bodily action in virtual realities articulate with more generalised social discourses about the qualities of material bodies. The transcendental ‘virtually present’ digital body finds compatibility with dominant accounts of embodiment offered in western thought.¹⁶ ‘Interactivity’ describes modes of available action and navigation with respect to the digital worlds encountered. It is the combination of immersion and interactivity that prompts some to argue that VR is invested with a ‘shift from perceptual to experiential reception of the image’ (Moser, 1996: xviii) because these worlds are ‘lived’ — read, acted, reflexively interpreted, practised through human beings’ presence and bodily action in a digital world.

Like video games, Virtuality®’s games are goal oriented. In *Dactyl Nightmare™*, *Legend Quest™*, *Zone Hunter™* and *Grid Busters™*, the goal is to shoot (or variously blow up) a series of opponents from inanimate objects, to non-human creatures to ‘human’ agents. A player accumulates points through these means, within a certain period of time. The ways this is accomplished is also familiar from video games. While in other games a player uses various input devices from keyboards to buttons or toggles, or joysticks, in Virtuality® games a player has a hand held device which also has buttons — the difference is that in Virtuality®, the device requires coordination in three dimensions rather than two. The device moves with the arm rather than the arm moving to/with the device (see Figs. 1-1 and 2-1 in

Chapters One and Two respectively, for depictions of these devices). The continuation of 'point and click' or button press navigation is problematic: it offers only limited 'interactivity', contrasting graphically with rhetoric which claims that virtual reality technologies are the 'ultimate' interactive systems as they can employ the whole body.

These opportunities for navigation and interaction are drawn from genres of video games. According to Provenzo (1991), video games such as Nintendo® are organised around particular kinds of bodily activity which become familiar over the course of learning the game, which by virtue of creating a culture of rules and simulations, become self-contained microworlds. For example, video and computer games tend to be goal oriented, and are internally reinforcing; the instructions and rules of behaviour are written into the games themselves, risks can be taken with few negative consequences, and skill is the ultimate arbiter of competence. The worlds rely on challenge, fantasy and curiosity, but rest crucially on developing strategic thinking, logic and planning skills, the accumulation of knowledge about the microworld of the game, motility and coordination skills, visual processing and iconic-spatial representation (see also Turkle, 1984; Kinder, 1991). Cognitive disciplines crucially depend on bodily disciplines which offer both freedoms and constraints for movement, action and interaction in a virtual world.

Visual processing, motility and coordination are tacit knowledges which are employed in the shift from video games to VR. While these skills are required to achieve the goals of the game, though, it is mastering the internal system of the game — its logics, the rules of its world and the behavioural possibilities of its characters (and mastering the control of one's own character to dominate or master the game) — that is a central factor which drives interest in video games. Such mastery and control also contributes to desire for participation in virtual realities such as those which Virtuality® produce (Sofia, 1992): and to master the game is to master the phenomenal logics of the technology.

Players quite often *lose* control, however, in the process of their participation in different virtual systems. In virtual systems which are located in leisure centres, participation takes place in a limited amount of time in order to maximise 'throughput' for those who run the centres (see Chapter Six). In the OSMOSE© system, on the other hand, limited participation time is introduced to structure exhibit sessions for the piece, in order to coordinate and audience for it (see Chapters five and Six). In each case, the world

‘recedes’ from the participant, and the system controls their exit from the world. Possibilities for action and interaction can therefore constrain bodily movement in very straightforward ways.

In the case of Sega® Netmerc, direction and movement are entirely controlled by the software — participants have no control over their movement or activity in the world at all, other than through pressing a gun button. This means that although it was possible to do so, it had not occurred to any of the participants I interviewed to turn around and look behind them (even though it was possible to do so). Phenomenologically, such worlds offer little in the way of an ethic of exploration of world and landscape, and rather impose a gaze and movement on it. Participants do not always have rational (or any) choice over their movement and participation in virtual worlds. They are instead positioned by the design of the system, which is in turn affected by the perceived context of use of the system (see Section Four). The social contexts of machine use therefore become crucial factors in how and why people can move or act the way they do in virtual worlds. These social context of machine use are explored in Chapters Five and Six.

A number of critics have addressed the desire for instrumental control in computer mediated spaces, especially the gendered dynamics of such desires (see, for example, Balsamo, 1996; Sofia, 1992, 1993; Turkle, 1984). Char Davies addresses such concerns directly by building OSMOSE© as an alternative virtual world, with ways of moving and acting in that world which are different from many other navigation devices.

‘Interactivity’ in OSMOSE© is a process in which the form of the navigation devices act referentially to refer participants to the materiality of their embodiment. The actions of *breathing* are crucial in OSMOSE©. Davies (1995: 5) argues that orthodox virtual reality programming relies on ‘everyday experiences of terrestrial space’,¹⁷ which bias these constructions towards ‘walking on treadmills, bicycling, and driving with joysticks’. In contrast, breath navigation seeks to ‘transcend’ this ‘everyday’ state, ironically by focussing on immanence: by focussing *more* rather than less on the embodiment of the subject connected to the technology, by making their embodiment an explicit component of the navigational apparatus.

In OSMOSE©, participants don a breathing ‘vest’ which allows their navigation in virtual space (see Fig. 4-6, earlier). The device allows participants to rise and fall through layers of worlds, and shifts the focus (or locus) of action in the embodied subject from large body and limb movement to the activity of breathing, so bodily action and movement is self rather than

outwardly directed. When breath becomes the means of navigation, controlled breathing, derived from the buoyancy control of scuba diving, exerts changes on the bio-chemistry of bodies (recognised not only in meditative practices, but also in medical practice for the control of pain). Balance is also an element of this device, as the immersant must change direction in the worlds by shifting the centre of balance forward and back, from side to side. This aspect of the tracking reinforces the focus of participation in OSMOSE© onto the orientation of the body in space, rather than on outwardly directed and spectacular bodily activity.

A participant breathes in to float upwards in the world, breaths out to float downwards. According to the makers of OSMOSE© (<http://www.softimage.com/projects/osmose>),

In contrast to conventional VR interface techniques such as joysticks or gloves which are based on direct linear manipulation, OSMOSE© incorporates the subtle, intuitive processes of breathing and balance as the primary means of navigating within the virtual world. By breathing in, the immersant is able to float upward, by breathing out, to fall, and by subtly altering the body's centre of balance, to change direction, a method inspired by the scuba diving practice of buoyancy control. The experience of being spatially enveloped, of floating rather than flying or driving, is key. Whereas in conventional VR, the body is reduced to little more than a probing hand and roving eye, immersion in OSMOSE© depends on the body's most essential living act, that of breath — not only to navigate, but more importantly — to attain a particular state-of-being within the virtual world. In this state, usually achieved within ten minutes of immersion, the immersant experiences a shift of awareness in which the urge to do and to control is replaced by a sense of floating in free-fall, as adrenalin gives way to quiet ecstasy and contemplative awe. Being supercedes doing.

As Game and Metcalfe (1996: 139) argue in the shift from orality to literacy, the shift from the 'voice' to the 'eye' allows for a relation of distance between text and reader and invites a bodily experience that feels disembodied. Char Davies echoes this in relation to VR when she argues that 'traditional' techniques of navigation in VR — those associated with other computer navigation devices such as the 'mouse' — 'require handling devices outside the body core, we felt they tended to reinforce the desire to control, as well as to create a sense of disembodiment' (Davies and Harrison, 1997: 4). While the notion of a bodily 'core' is problematic, relying as it does on dualistic notions of centre and periphery, inside and outside (Grosz, 1994), such a system nevertheless references a gaze 'back' to the material body which enables it.

According to Drew Leder (1990: 178) (whom Davies quotes):

Breath is a potent tool of overcoming dualism. Physiologically, respiration stands at the very threshold of the ecstatic and visceral, the voluntary and the involuntary ... inside and outside, self and Other are relativized, porous, each time one takes a breath. The air is constantly transgressing boundaries, sustaining interconnection ...

A sense of the ways that many audience members experienced embodiment in OSMOSE© can be gleaned from the comments of immersants when OSMOSE© was installed at the Musée d'Art Contemporain (Museum of Contemporary Art) Montréal, Quebec, Canada, from August 19-October 1, 1995. These are taken from comments already selected and published on the Softimage Webpage (<http://www.softimage.com/projects/osmose>). As such they are a form of advertising and publicity, and are therefore positioned by OSMOSE©'s creators as positive and supportive comments.

'Something gentle for the body and for the mind, a different relation with nature where the senses are intensified. An experience to do and redo...' MMC
 'An almost religious experience, certainly a meditation, very close to yoga...'
 'Floating. Gently falling. Breathing. Exploring. In delight, the wonders of a green universe. Merging within another creation, but no fear, instead, breathe in, inhale a world...' MP
 'An extraordinary work because it creates a state of being, and atmosphere where extrinsic and intrinsic fuse.' BU

This device does integrate the hardware, software and content to such an extent that the specific devices in the bio-aparatus utilised for OSMOSE© are integrated phenomenological elements of the experience. Instead of the connection between human bodies and machines being conceptualised as a technical 'problem' to be 'solved' by rendering the interface 'transparent, the intimate connection between bodies and technical artefacts in virtual reality technologies explores the potential of the technology as medium to specifically explore kinaesthetic and synaesthetic, subjective, experiential embodiment.

In commercial worlds built for arcades bodies become slotted in to VR systems with cybernetic logics — the body becomes an integrated element of the system, and comes to work for the system. OSMOSE© does the same thing in so far as the human body has to be attached in particular ways to the apparatus of OSMOSE©, and must work within the parameters of the system as it is already programmed. Rather than seeking to leave the body behind, however, the body becomes more firmly implicated in the logics of the system. It seems that Davies views the technics as inseparable from the worlds

under construction. For Davies, the goal of the apparatus is not only to develop an 'artistic vision and a defined aesthetic', but also to push the limits of possible technical artefacts and their combinations, a 'determination to push the expressive capabilities of the tools ... [as] paramount importance to the development of the technology' (1995: 2) (see Chapter Seven).

We have seen throughout this section how the qualities of digital embodiment encouraged a 'transcendental' bodily state by coding a point of view as a disembodied presence, coding bodily impossibilities, and coding a microculture of rules for active engagement with a digital world. Such processes can reinforce 'simulation', where signs of 'the real' are constructed through a disembodied distance between Eye/I and world, or can offer means to move across bodily spaces, to be (re)embodied in ways which are both familiar in everyday life, and different from them. The enactment of digital embodiment in virtual worlds is a range of practices which redefines what counts as embodiment, and how that is achieved. Through *learning* new technologies, participants themselves discipline their bodies (self-discipline) to the requirements of the technologies. Participants get to 'know' what virtual embodiment 'is', how 'it' is enacted, and assemble 'experience' as an effect of such practices. In doing so, they can be positioned as powerful in the bodily knowledge/ power relations which frame virtual reality technologies, by virtue of being able to explore virtual spaces and worlds, and re-configure their bodies to work in new ways in new spaces. At the same time, these disciplines also restrict bodies. Sense perception is restricted in some ways, shut off from a range of environmental cues, even as it opens in others. Bodies are also physically tied down to a technical system, even as their movement is enabled digitally.

Action and interaction in a virtual world clearly requires the close mapping of bodies into spaces. The lived relations through which specific bodies are 'mapped into' a particular system, and the disjunctures which can occur in such processes, are explored below.

Disruptions and Contradictions

What do cyborgs eat?

Margaret Morse *What Do Cyborgs Eat?*

The question ‘what do cyborgs eat?’ draws attention to the organic elements of virtual systems, and points to the unruly, the messy construction of organic life which can disrupt the binary logic of a feedback system. In the above sections I have indicated where human connection to a bio-apparatus disciplines bodies and enables presence, action and interaction in a world. I have looked at how the phenomenal experience of different systems can prompt a range of embodied positions in ‘becoming virtual’. In this section, I want to briefly explore some of the problems and disjunctures that can arise when using a VR system.

In the first section of this chapter, I argued that technologies disciplined their participants, and that techniques worked on the body to constrain its perceptions and actions in various ways. As such, they are ‘normalising’. Ramazanoglu (1993: 22) argues that ‘[n]ormalisation indicates the extension of control and self-regulation. Discourses define what is normal, and what is not normal is then seen as in need of normalisation or conformity to the norm.’ The relevant bodily norms of VR have been discussed throughout Section Two in terms of the subject positions and forms of embodiment predominantly available to participants in VR. The generic body represented in virtual worlds, or positioned by a point of view and possible actions, is not only a transcendental body, it is also a ‘normalising body’, in the sense that it describes the parameters of what is ‘normal’ for human (gendered, raced, sexualised) embodiment (Bordo, 1993a). To this extent, formalised and abstract digital bodies encode discursively produced understandings about the range of forms and activities of human bodies, about their appearances, their qualities, and the physical disciplinary processes appropriate to their construction.

Participants draw on their pragmatically defined sense of physical and psychical embodiment to make sense of their digital embodiment. As Nast and Kobayashi (1996: 82) argue with respect to the dominance of vision and perspective, subjects are only positioned as disembodied with respect to *some* collections of objects and other persons. The irony is that a very specific constellation of objects and bodily techniques are required to activate such ‘disembodiment’. The specifics of bodies thus always intervene in the attempt to construct either a transcendental viewing position, or a flexible and malleable viewing position.

Not all physical bodies can be ‘mapped into’ digital simulations of bodies. Bodies come in many highly differentiated shapes and sizes, ‘colours’, characteristics, behaviours, capabilities and attributes. Some bodies can be

mapped onto the digital representations of bodies in Dactyl Nightmare™, some cannot. For example, rhetoric about virtual reality technologies draws heavily on stories about disability when pointing to the transcendental qualities of the technology. One story, told in Hamit (1993), is worth repeating here, as the specifics of its narrative fable have implications for the particularities of matching technical systems with *specific* bodies. Throughout the book, a narrative is established which is the story of a (heterosexual) woman and man who meet online via virtual reality. The woman, Julia, has earlier been described putting on a body/ data suit and practising managing a puppet persona body on a treadmill before she goes 'online' at a party. The man she goes to meet at the party disappears offline when Julia suggests they should meet in 'real life'. She approaches a 'cyberspace detective' to find him (Hamit, 1993: 274-275):

"You have to hire a real detective? I thought *you* were a real detective!"

"You ain't listening," Spade said. "I said 'real-world'. I only work in cyberspace." She stared at him doubtfully.

"Look," said Spade. "I'm going to break character here a moment. My real name is Miles Evers. I am state-licensed as a private detective. I qualified for that by doing years of record checks and skip-searches. I don't do real-world gumshoe work because I can't. I'm quadriplegic. I got 24-hour-a-day nurses, but I work here in cyberspace... and I'm good. If your guy can be found, I'll find him."

Julia blushed and stammered, "I'm sorry, Mr. Evers."

"The name is Spade, sweetheart," the detective said, blowing out another cloud of smoke...

She stood up, feeling that she owed it to the man to play into his fantasy just a bit. She walked sexily to the door and looked back at him over her shoulder.

"Don't disappoint me, Mr. Spade," she said, her voice as husky as Bacall playing against Bogart.

Spade almost smiled. "Class always tells," he replied. "I'll find him."

Leaving aside the use of 'hyper-gender' from forties gothic film noir, the authors of stories such as this elide the physical realities of connecting with VR systems (as currently configured, particularly in public space).¹⁸ No mention is made of how quadriplegia affects connection online in this scenario. Julia must connect via a body suit and head mounted display, and earlier use is made of how she must physically practice her online persona. No mention is made throughout the book of how disabled characters connect given differential use of their bodies. How are the commands executed for the Spade character to move, if they are different from those which Julia must employ? Eliding the materiality of the body in this way constructs a rhetorical utopia in which bodily realities can ostensibly be transcended via virtual

reality technologies. At the same time, such discursive utopias, connected as they are with ideologies of technical progress, are materially limited.

While some physical disabilities, such as the disability described above, are evident to others, some disabilities are ‘hidden’ — but equally exclusive in virtual reality technologies. Not only do bodies need certain attributes such as vision and limbs to participate in these worlds, they must also have attributes more usually ‘hidden’. An inner ear imbalance, for example, can produce violent nausea while playing, which effectively excludes participation on the part of those individuals.

The incomplete mapping of bodies is not by any means restricted to ‘disabled’ bodies (as Jenny Morris (1991) notes, ‘ability’ is an *effect* of context). The incomplete fit of particular human bodies, the importance of their peculiarities in relation to a generic technical object, seems to be an important part of participating in virtual worlds. Differences amongst bodies are not only individual, but such issues are also collective. For example, a certain height and weight range is assumed in the design of the systems, and those outside this ‘norm’ are rendered not ‘impossible’, but at least ‘problematic’ bodies. I, for example, always seemed to have problems with my size. I am by no means ‘unusually’ small, but the machines always seemed to be ‘pre’-configured to much larger sized people when I went to use them. It was always a laborious process to change every setting on every piece of equipment to fit my body to the system. I found it difficult to decide how gender worked through this social dynamic, but there are several possibilities. One is that the machines were designed with generally larger people in mind (especially given, for example, the weight of the headsets), but the possibility that smaller groups of people existed was acknowledged in different size settings. Another possibility is that in use, because far more men than women use any virtual reality system (Hayles, 1996; Stone, 1996), the machines are generally left at larger settings because there is more likelihood of a ‘larger’ (i.e. ‘masculine’) person participating. In turn, this could mean that because such an experience is made more labour intensive, women become less likely to participate as the technology becomes ‘unfriendly’. I suspect all these dynamics impact on the lived experiences of using the machine, and I suspect others shared my difficulties — although I never asked this question directly in the interviews I conducted.

There are other pragmatic activities associated with ‘fitting’ a particular human body to a particular technological system and, when ‘fitted’, the player continues to interact with a system of objects in the material world at

the same time as interacting with different kinds of objects in the digital world. I learned that like myself, others experienced an ambiguity in their sense of embodied subjectivity when they engaged with virtual reality. Jill Scott and Sally Pryor (1993), for example, detail experiences very similar to my own sense of fragmentation and disjuncture. They describe the discomforts of having eyes forced open and weight on the face and gazing at bad screen resolution.¹⁹ They describe the difficulties in learning new movement in contrast to and removed from their previously learnt modes of embodied movement, and the ways that those outside must direct their actions in virtual worlds (Pryor and Scott, 1993: 169).

I trip over some cables and it reminds me that I am connected. Restricted by being connected ... It also takes time to sort out exactly how to place my body, but the system is hampered by magnetic interference outside my control. Now it is flashing, I obviously tilted my head too far. Interesting to be so concerned about the body's exact position in space! ... 'Do I look ridiculous from out there?' 'Yes,' they all say ...

People must position their heads in distinctive ways inside the headset for the three dimensional effect to work (around ten percent of people cannot perceive, through the peculiarities of their own visual perceptual apparatus, the three dimensional effect of the stereoscopic head mounted display). Their bodies are firmly attached to the computer system that generates the world in various ways, via cables in the HMD, as well as cables to tracking devices and other input/ output devices such as gloves or 'joysticks'. In Virtuality® units, for example, participants are attached to the framework of the 'pod' via a retractable cord which they must be careful not to get tangled in when they move from side to side or turn around; and they must manipulate a handset, with one button as the trigger for a 'gun' in the digital world, while another allows them to move forward in the digital world.

The requirements for action in Virtuality®'s digital spaces are not always compatible with those of the material spaces that the organic bodies simultaneously inhabit. There seems to be a number of tensions between the characterisation of virtual spaces as 'bodiless' and the intrusions of embodiment. Through these tensions, people inhabit both digital and non-digital worlds simultaneously, and often experience disjunctures in that experience — for example, a person whose touch is familiar is rendered unfamiliar when there are no material cues. One participant commented that

You could always see ... you were always conscious that there was the light creeping in round the edges of the glasses. Then when [his partner] touched me, I got a bit of a shock out of it (Interview, Auckland, November 1996).

Virtuality®'s advertising images of the activities available in virtual systems and the bodily activities of individuals using those systems are worlds apart. In the advertising, individuals are portrayed as active, their bodies moving around swiftly, aggressively shooting opponents and ducking in the return fire (see, for example, Fig. 4-9).

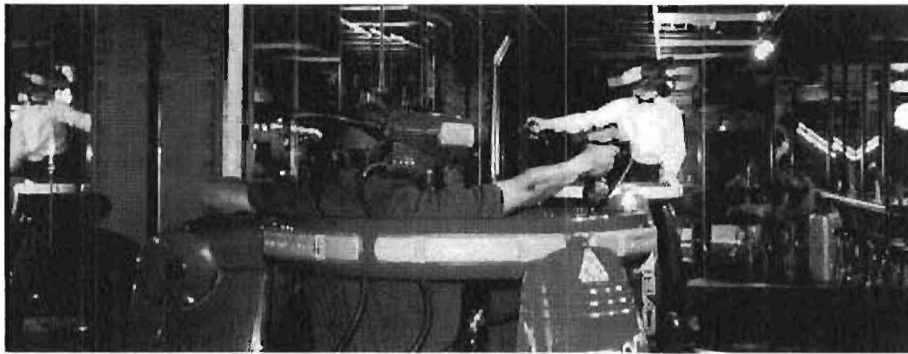


Fig. 4-9
Shooting action in Virtuality® worlds
Virtuality (1993) p. 17
© Virtuality® Ltd.

Such images are even more effective when depicted in moving pictures, such as video advertising and 'previews' (see later Sections). There were times when I unconsciously found myself taking a whole body 'stance' for 'shooting' — a stance that I have never taken at any other time, but which I have been exposed to thousands of times in television shows. In the main, however, playing the game was 'inactive' rather than 'active' for me. I could feel myself shuffling around and tangling the cord; and I have seen others who were just as unsure of themselves becoming awkwardly slow or even brought to a complete halt by their confusion at new ways of moving.

The interfaces of digital realities are not at all 'intuitive'. They require significant learning and, even when repeat players master the skills required to move in these worlds, the 'interactivity' they provide is limited. In the interviews, I asked participants how they moved in virtual worlds, and they sometimes found it difficult to explain — simply because the explanation required them to give an account of both digital and non-digital worlds. What did emerge clearly in the interviews I conducted with participants was often a sense of frustration at the restriction of bodily movement. Whereas

Julia had assumed she would move in the direction she was looking (as she expects when, for example, walking around), that didn't happen in the Sega® game that she played:

(Julia) Well it was really hard to figure out how to move. I thought if you turned your head you'd be able to see different things, but it wasn't like that.

(Nic) So could you ... see where you were going to determine your own movement in the world, depending on how you ... pointed your head?

(Julia) If you turned the turret you could ... see others, but not move ...

(Nic) But not when you turned your head?

(Julia) It was just staying on the same thing. It was like you're moving your head but going in the same direction ... (Julia, Interview, Auckland, November, 1996).

Another participant at a different site claimed that in Legend Quest™,

the game play was kind of tricky because you needed to get in close combat with people ... In a small confined space with four human players and then, you know, a dozen computer opponents, it was really confusing actually ... you don't really know what's really going on (Ben, Interview, San Francisco, March 1996).

Similarly, in OSMOSE©, one does wonder at Davies' (1995) insistence that breath and balance are 'intuitive, instinctual, visceral' processes. Breathing, it seems, could be defined as instinctual and visceral (in those moments when one is not attempting to *control* breath as they are in OSMOSE©), but certainly balance needs to be learned as motor skills develop when young — and not all bodies are capable of those movements, or are able to accomplish shifts in balance (particularly in the case of the inner ear imbalances cited above). While the device is 'intended to re-affirm the role of the living physical body in immersive virtual space as *subjective experiential ground*' (Davies, 1995: 4), and as such is categorised as 'intuitive', it had to be carefully crafted by those who produced it. For example, the trackers on the vest measure the expansion and contraction of the chest rather than 'measuring breath' per se. Initially, the trackers were to measure diaphragm expansion and contraction, until those in the project team realised that very few people practice deep diaphragm breathing, and tend instead to breathe shallowly, from the chest and the top of the lungs. The sensors therefore had to be moved further up the vest on to the ribcage for the tracking to be effective. According to Davies, those who have some trouble with their breath might find the interface tricky. 'We found that singers, dancers, divers etc -

people who work with breath - caught on the easiest of all. Some people had a tendency to sink, others to rise' (Personal Communication, 1996).

Incomplete reciprocity between machine and human bodies is not, however, always the result of human action. Often it is assumed that because the machine is 'pre-given' in any location it is the constant element in the system/ relationship, and the human the problematic element that needs to be fitted to everything else. While the system needs to work as a *system* for the parameters of a particular sense of presence and immersion to be achieved, *both* the machine and the human can misbehave. On the one hand, quite regularly the actions of the machine render human movement problematic. As one VR retail store manager explained the problems that he had encountered in a Virtuality® Unit:

Typical problems would be ... the tracking would be off ... like you put your gun straight in front of you and it would look like it was coming out of your head or coming out of your waist or you couldn't even see it for some reason. Sometimes the characters would be floating — you'd look down and it would be like your character would be six feet off the ground for some reason (Ben, Interview, San Francisco, March 1996).

It was not only the tracking that was problematic in some machines, but there were also disjunctures, for example, in the head mounted display which 'allowed' intrusions from the non-digital world. When I asked one participant (Interview, Auckland, November 1996) whether they could hear sounds of the 'outside' world through the helmet, he responded that he 'could hear them all and you could see underneath the helmet ... [but that he] was just concentrating too hard on trying to see what's in there.' Others that tried Sega® Netmerc agreed, but similar sentiments were echoed for many of those I talked to about different commercial units:

(Man) Well first of all I couldn't actually see anything properly, it was really blurry ... Yeah, so the eye bits weren't kind of like adjusted very well.

(Nic) What about the graphics. What were the graphics like?

(Man) Oh, they're OK. Not as good as I was expecting.

(Woman) Well you could hardly see a thing, eh.

(Interview, Auckland, November 1996)

I have known staff in retail outlets to 'fix' the objects when they are not working properly by smacking one in a predetermined spot, much as one would an old and recalcitrant radio or television set. Because of disjunctures between digital and material spaces, the illusion of digital body enhancements or freedoms tends to be shattered when one is suddenly halted in mid-

movement by a large plastic bar which 'isn't there'. As a prosthetic extension which transparently 'frees' the organic body from physical limitations, digital realities remain vulnerable to the intrusions of the physical world.

Incomplete 'incorporation' can constitute an effective resistance to the cybernetic feedback loops formed in VR, whether or not such resistance is under the conscious control of the participants involved. As Sawicki (1991) notes, the conditions that facilitate increased disciplinary effects simultaneously facilitate the conditions for resistance. Some resistances are specifically a matter of choice as far as the participants perceive it, especially the choice to participate or not to participate. Two participants (Interview, Auckland, November 1996) comment on Sega® Netmerc:

(Nic) Would you do it again ? Is it worth it ?
 (Woman) Might do if they fixed the view up a bit
 (Man) Make you see better ...
 (Woman) Couldn't see a thing, eh ... yeah it's really really blurry.
 (Interview, Auckland, November 1996)

For some people, the experience of the disjunctures overwhelmed the novelty of trying unfamiliar technical systems and being immersed in a digital world. One woman I talked to who had tried the Sega® game said that the technology was just 'flunkey':

It's interesting but flunkey ... I was disappointed really. It was kinda ... hard to control, the movements weren't precise, the steering wasn't good ...
 (Interview, Auckland, November 1996).

Other participants 'forgive' the downfalls of the machine under the rubric of the discourse of technical 'progress', and in the interests of perpetuating the possibility of continuing to consume (bigger and better) virtual experiences. While the form of the material object is not always consistent in its attempts at a seamless high-tech fantasy of human/computer systems, the idea that these systems are 'a step on the path' is very powerful. One young man based his evaluation on a linear map of such progress in entertainment systems:

(Man) I think the graphics will improve. I thought they were a bit blurry but it's a commercial unit so I'm sure there are better units available ... but you do get immersed into it, which is good.
 (Nic) Well how did that compare to ... all the other stuff that's in here?
 (Man) Apart from the ... vision not being all that too clear, it was, you know, comparable. Obviously the graphics are a bit more chunky but that's just memory and stuff like that but I think it'll improve ...
 (Interview, Auckland, November 1996).

Others are explicitly resistant to the technical systems which are offered them on the basis of their expectations of the pleasures such systems provide. In the case of OSMOSE©, for example, instead of a discourse of technical 'progress', some participants employed words and actions which suggested their disinterest in the bodily sensations offered by participation in OSMOSE©. Char Davies (Personal Communication, 1996) describes such a case as a generational issue:

there were two twelve year old boys who were not immersed but watched the video at the museum and they said they hated it because there was nothing to do, it was too slow, nothing to kill, nothing came at you etc — so I told them to go across the street and play battletech which was designed for them! Younger children — before they get to the age of wanting to mimic what they see in the media, (ie shoot, score, chase, kill etc) however were enthralled.

These boys want to participate in dominant or mainstream scenarios in a virtual world, and such pleasures are not offered in OSMOSE©. As Beryl Graham (1996: 157) remarks,

some of us are ... destined to be disappointed if the work doesn't talk to our particular pleasure. If you are expecting pictorial pleasures, then those images should be beautiful, if you are expecting televisual pleasures then the artwork has to override the other ambient stimuli ... On the other hand if you are expecting video-game pleasure then maybe you actually *want* your pleasures to be 'spatially decentred, weakly temporalised and quasi-disembodied'.

The boys in question were intervening in the interpretation of the available technology as social agents, and making something different of this piece of material culture than what its makers intended.

Other participants draw on quite different resources for mediating their lived experience with the technical system. Another means to make different stories out of the material resources of virtual systems is by using the hardware. The material artefact itself can prompt imaginative participation without the aid of 'immersion' in a digital world at all. While spending time at 'family entertainment centres', I saw young children over and over again climb and play around the machines, take action, construct scenarios for themselves, wearing the HMD, without ever actually participating in a digital world. Some used the headset to tell their stories with each other, and when they did, the headset (and other equipment) was invariably ten sizes too big, and I saw them struggling to hold it on their heads as they had seen others do. They could not possibly have viewed the software, but even had the software been playing, it would have made no difference. The children were using the

materials that were there to find fantasy scenarios for *themselves* and each other, as they do in elsewhere in daily life.

Conclusions

Immersive Fantasy: “OSMOSE©”... I ... experienced several of the worlds in the piece as an occasion for panic. Like many asthmatics, being underwater makes me deeply and instantly afraid. Evidently, even when the water is symbolic, I experience it viscerally as water and as everything smothering that water means to me... Consider also that I have a math phobia and that one of the worlds in the piece consisted of machine language which scrolled upward faster than I could escape it by breathing in more and more. As I got more and more panicky, the programmer John Harrison revealed that the way out of machine language world was to surrender and sink into it. Despite my own reaction, I could understand the intention of the piece, to “encourage the immersant to effectively ‘let go’” in a meditative experience that reconnects the body and the world. The piece also underlines that we can and do experience symbols viscerally and emotionally and that these symbols do not have just one meaning, but many potential and experientially determined ones

Margaret Morse *Virtualities*

Margaret Morse’s intimate account of her immersion in OSMOSE© describes the visceral as well as cognitive responses to virtual reality technologies, felt deeply in the body: materially as well as culturally enacted, physically as well as socially inscribed. This statement draws attention to the kinds of embodiments being generated through the disciplines of virtual systems, and their potential for destabilising relations of power which are worked through the body. The enactment of embodiment — the ongoing negotiation of corporeal boundaries — is subject to the organic body’s pragmatic encounters with technological systems. The disruptions experienced by participants, and the resistances they enact, suggest that participants ‘invest’ (Moore, 1994) in the phenomenal aspects of virtual systems in sometimes quite contradictory ways: they can become immersed, at the same time as resisting the modes of action available.

It has become apparent from the ethnographic stories explored here that participants approach virtual systems as both familiar/ mundane and new/ fantastic technologies of bodily gestures and action, which are interpreted and enacted on the basis of already habitual bodily competencies, and by generating new competencies. Virtual systems employ viewing perspectives familiar from film spectatorship, for example, but at the same time reform bodily habits by encouraging interactive interventions in the scripts of the worlds presented there.

My interest in exploring these stories has been to address how physical participation in a technical system is *achieved*. If one asks people about their experiences of ‘becoming virtual’, it seems that it is not as easy or as straightforward as the ‘disappearance’ of the ‘interface’ or ‘the suppression of the body’ in seamless technical processes. Virtual systems intimately engage a range of perceptual and motile bodily moments to construct virtual worlds—vision, sound and motion. The physical elements of virtual technologies vary both with different systems, and how they connect with the bodily histories and biographies of the participants.

Embodied experiences in virtual realities are constructed and mediated through both the coding of software (conventions of digital signification), and the coding of hardware (artefacts or objects), which rely more on kinesthetic, proprioceptive and motile interaction in interpretation. A common regime of bodily disciplines is necessary to position the human body in relation to the similar aspects of virtual systems so that a ‘virtual experience’ is achieved. These include the head positioning in a head mounted display which constructs a point of view and sense of ‘presence’ in a world. The dominant perceptual coding of presence or immersion in virtual systems is of a transcendental, first person point of view, and which centres the world in the gaze of the controlling, moving subject: embodiment can become a ‘point of view’, ideally dissociated from bodily relations of mass, gravity, viscera and nerve endings, and inserted rather into digital subject positions which enable bodily ‘impossibilities’, such as the separation and reconstitution of bodily parts.

If one can (impossibly, but at least rhetorically) forget one's body, one is excused from addressing the messy and problematic social relationships which produce such technical systems. If the relations of digital representation encourage amnesia with regard to the relations which structure difference and inequality on the basis of embodied physical markers, the relations of virtual artefacts encourages amnesia with regard to the labour and ecology which physically produces them and embeds them in ongoing social relationships.

It is possible for virtual systems to disrupt these conventions from within virtual worlds, however, as in the case of OSMOSE© or Ephémère© (the work completed in 1998 which succeeded OSMOSE©). Particular techniques of bodily positioning in different systems engage specific parts of the body — eyes, hands or breath, for example—to encourage the process of ‘becoming virtual’ in different ways, in different systems. Worlds such as OSMOSE© are

more likely than others, by virtue of the physical form they take and the modes of digital and physical action they enable, to refer participants to their embodiment in both programmed and nonprogrammed worlds as a new 'ground' for discourse. One participant cast this subjective and phenomenal movement as an experience of joy:

'What a marvellous and joyous experience. All of the rhetoric about 'VR' can be dissolved by this work to produce a new ground for discourse — gentle and magical... I never have felt so elevated before by an immersive work, only by the actual experience as nature or dream... As Gene Youngblood hoped, here is a work wherein we, as a culture, have been able to create at the level which we destroy, that is, this technology, so often used for the extrapolation of the banal and the exploitation of violence and fear has been turned to the creation and experience of wonder!' GW ([http:// www. softimage. com/ projects/ osmose](http://www.softimage.com/projects/osmose))

Disciplines both enable the worlds under construction, but can also constrain bodily movement and the experiences of digital worlds. These objects and systems may or may not fit their particular physical bodies, and, if they do not, their access to virtual worlds becomes difficult, sometimes impossible. While at times objects can be changed/ adjusted to fit the specificity of human bodies, at other times human bodies are adjusted to fit with the machine. The habitual gestures of stance, of large body movement can be confined by the physical configuration of the machine, the restricted movement of the head due to weight and cabling on the head mounted display, the tension felt in the back as the attachment cord pulls the body backwards, the surprise of a plastic bar across the stomach when one moves forward too far. Bodily movement can also be restricted by the speed of the processor available which affects how fast a person can interact in a world.

Similarly, it is possible for people to react to the system in ways which subvert the intention of the world, as was the case with Morse's description of her journey in OSMOSE©, above. Equally, it is possible for people to use the systems in ways completely unintended by their makers, as was the case with the boys who acted out their fantasies with the equipment without ever starting up the software (or paying for the privilege).

The production of virtual bodies is thus a phenomenologically partial process in virtual systems. In virtual worlds, investment in identities and social practices therefore depends on an individual's creation of continuity and divergence within and between their presence in both digital and material worlds. The politics of virtual realities involves both the politics of signification as a 'struggle in discourse' (Hall, 1980: 138), and the politics of

technical artefacts as instances of phenomenologically located material culture. The experience of participating is not bounded by the moments when the digital action begins and ends, but is constituted through the process of participating in material, as well as digital, spaces. We therefore need attention to the specifics of the contexts in which virtual systems are enacted.

In the following two chapters, I turn to questions about how immersive virtual systems are becoming embedded in everyday, public life. The spaces, places, locales and sites where virtual systems are realised, are social and cultural resources in their enactment. This enactment of virtual systems further provides resources for the social relations of technical development, which I address later in the thesis. It is to the former questions of 'locating the virtual' in public sites to which I turn in the following section.

Section Two

Experiencing the Virtual

Conclusions

‘But why all this labour and expense to *counterfeit* - is that the word? Why should we counterfeit reality at all?’

Renie hesitated. ‘Well, by learning to ... counterfeit reality, we can make things that cannot exist except in our imaginations, just as artists have always done. Or make something to show what we would like to create, as builders do when they draw a plan. But also, we can create for ourselves an environment that is more comfortable in which to work ... Using the machines on which our lives depend can be made ... easy ...’

‘So we seem to have come in a full circle. We complicate our lives with machines, then struggle to make it as simple as it was before we had them. Have we gained anything, Ms. Sulaweyo?’ ...

‘Our powers are greater, we can do many more things ...’

‘Can we talk to the gods and hear their voices more clearly? Or have we now, with all these powers, *become* gods?’

Tad Williams *Otherland*

Experiencing the virtual is a fraught and complex process. Virtual worlds present complex, overlapping texts and actions which weave fantasy and reality, identity and difference together in novel ways of being embodied. Like cyberpunk fiction, virtual embodiment ‘do[es] not simply devalue the body, but

instead also foregrounds and interrogates the value and consequences of inhabiting bodies' (Foster, 1993: 11). The meanings, signs and kinesthetic feelings engendered by virtual worlds produce virtual experiences, multiple experiences which hold the potential to generate material and epistemological 'trouble' (Traweek, 1996: 50).

Throughout the process of their social enactment, virtual worlds contest boundaries of 'self', 'body' and 'reality', even as they also reinscribe conventional markers of difference and identity in digital form. The 'gaps and lacunas' (Kendrick, 1996: 160) between perception, action and subjectivity allow for multiple and contradictory moments in the formation of virtual identities and bodies. Bodies become sites of *contestation* for familiar and new configurations of identity and difference.

At the risk of stating the obvious, the analysis throughout Chapters Three and Four has suggested that the local enactment of virtual identities and embodiments is the process of *constructing* them, and that power works through multiple relations in this enactment. Attending to how participants concretely position themselves in relation to the local technologies and worlds they encounter addresses and challenges reductionist debates around subject formation and embodiment in virtual reality technologies. Ethnographic storytelling has been an important resource for interrogating selves and bodies in virtual worlds. The descriptions of those using the technologies can be used to interrogate both theoretical and popular accounts of virtual systems.

Debates about identity and embodiment in virtual reality technologies have heretofore tended to concentrate on the 'subject positions' provided by the (technical or social) configuration of virtual systems, at the expense of investigating how embodied and historically located social subjects engage in both digital and non-digital worlds. Some concentrate on the boundary crossing possibilities presented by new forms of technology in technologically deterministic ways (Aukstakalnis and Blatner, 1992), and neglect the actions and investments of 'always already' embodied subjects (Grosz, 1994). Others tend to focus on how virtual systems do or do not express the qualities associated with attributional categories (such as gender and class relations) (see, for example, Kramarae, 1995), and neglect the interactive, performative and contingent character of much social life.

The analysis here suggests that such analytical reductions can be addressed by treating virtual systems ethnographically, as objects with phenomenal and interactionist properties embedded in local worlds (Law, 1987), *and* as media which employ particular regimes of signification and narrative (Bleecker, 1995; Williams, 1974). What gets marketed in sites of VR participation are embodied *experiences*, rather than the specific content of the worlds. ‘Experience’ is a highly negotiated category, but one which is employed routinely as a means of communicating events, giving legitimacy to our interpretations of our relations with other people, things and institutions. ‘Experiences’ are stories to ourselves and others about how we make sense of our place in our social, cultural and natural worlds. Experiences are not causes or effects of technologies, but rather processes which are co-constructive of technologies, carried out in highly complex sets of material, textual, semiotic, artefactual, organisational and interpersonal networks of relation. ‘Experience’ therefore involves placing oneself, or being positioned bodily, economically, textually, artefactually, imaginatively, politically and interpersonally through social relationships which one ‘perceives and comprehends as subjective (referring to, originating in oneself)’ (de Lauretis, 1987: 198). ‘Experience’ does not stand here as an authority or essential grounding. Rather, it is a means to examine and problematise a field of competing discourses and practices which materially and discursively institute virtual reality technologies and virtual worlds, and the politics of these processes.

This assemblage of ‘experience’ is open to analyses of representation and discourse (Mulkay, 1985), as well as interactionist and network theories of action (Ormrod, 1995). The disjunctures and connections between these modes of analysis are not always readily apparent, but my analysis here suggests some useful cross-fertilisation, particularly in theorising subjectivity and experience. In both these analytical endeavours (the connections between which will be increasingly developed throughout the thesis), a phenomenological *attitude* to knowledge is useful. Game and Metcalfe (1996: 169-170) argue that

the phenomenological project is one of getting at the specific quality of any phenomenon via experience ... [a] concern with a knowledge that addresses the specificity of phenomena and the particularity of lived experience ... *Knowing*, then, takes place in an encounter between self and the world, with no attempt to transcend or master the sensual world or the encounter with it. Knowing is in life. Thus it is an experience that is thoroughly embodied and affective ...

The stories told me by participants, which detailed action and interaction in virtual systems, made clear the lack of attention participants paid to attributional representations of embodiment in virtual worlds. Instead, such narratives pointed to the importance of embodied *performances* which drew on numerous resources to construct virtual 'self': the possibilities for action and interaction, point of view, bodily and subjective histories, and already existing identifications. These stories about virtual reality technologies in everyday life suggests that people find easy congruency between their everyday identities and the narratives of virtual worlds. Overwhelmingly, those I interviewed experienced few obstacles to taking up the (albeit contradictory) 'I' of everyday life, both because of and despite the signficatory and disciplinary resources provided by virtual reality technologies.

Interpretation, action and reaction are thus positioned through the particularities of code and context in any social world, as well as the competencies and investments of participants in reading the codes of identity narration in digital worlds. The creation and interpretation of embodied presence in a virtual world can both reinforce and challenge dualistic ways of thinking about being experientially embodied. It can be both congruent with 'everyday embodiment', and can challenge the differences constructed thereby.

Participant's descriptions of becoming digitally embodied indicated that the connections between binary and heirarchised terms, their consistencies and disjunctures, work in multiple and sometimes problematic ways. Similarly, the bodily disciplines associated with the performance of virtual reality problematise the signficatory conventions of worlds. Virtual worlds provide symbolic and interactive resources for individuals to invest in particular configurations of bodily identities and practices: signs, metaphors, narratives, and techniques of human interaction with them work together to 'assemble' virtual embodiment. Such resources are drawn from competing fields of meaning and interaction within and between worlds. Identifying dualistic modes of meaning and how they structure subject *positions* doesn't address the complexity of intersecting discourses and practices which generate multiple and sometimes contradictory social *subjects*. Virtual worlds signify gendered digital bodies through both identity and difference, and analysis may identify the boundaries of difference in operation as presented by the text of any virtual world. Across the worlds I

investigated, disembodiment/ embodiment, inside/ outside, real/ virtual, body/ mind, presence/ absence, masculine/ feminine, all structured the texts of virtual worlds in various ways.

'Presence', as a dominant mode of becoming virtual, is problematic to the extent to which it draws on historically masculinist ways of seeing, and the way it employs conventional markers of difference in a dualistic system of representation. In worlds like those which Virtuality produce®, 'presence' and immersion are often constructed and interpreted as the experience of disembodiment. The discourses which position individuals include desires for 'freedom', for escape from the 'limits' of organic embodiment, and for the colonisation of newly formed digital spaces, all via the 'heroic' achievement of technical 'progress'. As Patricia Wise (1997) notes, however, it is important not to assume that because computing technologies have tended to reflect dominant ways of marking boundaries, identities and difference, that this will always and everywhere be the case.

If 'gender' (for example) is considered a *process* as well as an ongoing and continually achieved *product*, then the analytical significance of the everyday phenomenological world is foregrounded. Bodily and subjective histories are brought to participation in technologies and worlds, and are situated amongst competing discourses. Discourses of transcendence, of technical progress, are subverted by participants' own critiques of and resistances to video game violence and the hypermasculinity of some virtual worlds narratives. In other worlds such as OSMOSE© and Placeholder, 'virtual reality' can be both reflexive about and resistant to dominant ways of seeing. The ethnographic narratives presented by those participating in OSMOSE© indicated clearly that disembodied 'presence' is an unstable position, constantly negotiated. 'Presence' does not therefore imply an 'absence' of material and historically situated embodiment, but rather a local and contingent means of being embodied across both digital and non-digital locales, organised in such a way as to rework bodies in ways that are unavailable in physical spaces.

The characters and scenarios provided by virtual worlds sit alongside the existing subjective resources of participants, and in which participants already have more significant and lasting investments. These contradictions mean that I can feel confusion when my body and my opponents are both 'generically' coded masculine, while another woman in the same game declares her own body that

of a 'woman' and maps a real life goatee to a digital body 'without' one. Similarly, the transcendental point of view through which Doug's family home is viewed is more 'transcendental' for me than for him because the memories of occupying that space are written not into my bodily memories, but into his.

As we have seen in preceding chapters, bodies are produced not only through desire, but also through discipline and the regulation of the physical body: the regulation or constraint imposed by technical objects and modes of action possible in relation to them, and the desire for physical knowledge and competency. Because virtual reality technologies draw in some ways on familiar technical disciplines and the competencies associated with them, the disciplines of virtual embodiment are an extension of embodiment elsewhere. People already have complex investments in various technologies as participants who live social worlds familiar with contemporary body altering technologies.

Competencies gained from reading texts and images, as well as competencies gained from television and film (ways of looking), are deployed alongside familiar bodily movements (gestures and habits of movement) derived from a range of sources, such as everyday movement in three dimensional space which has gravity, but also gestures that are seen but not practised, as was the case with the stance I occupied while 'shooting'. The power of VR to create compelling 'composites' through these desires and disciplines is considerable. This implies that the range of possibilities in modes of becoming virtual is also considerable. The wider the range of bodily perceptions and skills that can be engaged, the wider the range of bodily states which can be simulated, and the wider the range of bodies which can engage with proliferating virtual technologies. Such strategies extend the workings of power/ knowledge in digital worlds through extended powers of visibility, categorisation and manipulation (Haraway, 1997; Foucault, 1973, 1979). Recognising multiple and sometimes contradictory subjective moments — the confusion of presence and immersion in a digital world through the interventions of physical space, the interruption (or not) of everyday gender, the continuity of breath interrupted with desires for the speed of video-game movement — offers a way into the sometimes/ otherwise imperceptible working of power in technocultures. As Balsamo (1996: 127) notes, new technical systems 'do not create disembodied citizens. Rather, they are themselves consequences of changes already in place.'

The investigation of these worlds, processes and interaction suggests that power is dispersed amongst a range of identities and activities in the process of experiencing the virtual, and operates through how subjects are defined as virtual actors through their participation in virtual technologies. Menser and Aronowitz (1996) argue that power works in often imperceptible ways, and that the more imperceptible it is — the more difficult it is to identify where and how power relations operate — the more difficult it is to appropriate and subvert. As we have seen in virtual reality technologies, a politics of subjectivity coalesce exactly these minute techniques of power. If we assume that power is distributed through both activities and signs for them, looking at both offers chances to avoid determinism in our maps of power relations.

If virtual realities bring together worlds, desires and disciplines in new ways, making the *performance* of identities and embodiment explicit, it offers opportunities to interrogate elements of identity and embodiment, and their meaning in contemporary technocultures. Primarily, such representations and the desires they incite offer the opportunity to ask what and who are virtual spaces for, why 'inhabit' them, and what can be achieved there? Furthermore, it offers opportunities to rethink what it *means* to be 'gendered' or 'raced' in *nonprogrammed* spaces. Instead of believing the rhetoric of disembodiment, we can interrogate the consequences of being embodied in particular ways.

Participation is influenced by the strategic positioning of individuals who assess their desires for consumption in relation to their perception of how, and whether, those desires will be gratified, and by the possibility of a refusal to be complicit in the production of these desires for their bodies. Digital worlds can be rejected outright in a refusal to engage with the content of the digital world. Predominantly cited with regard to many gaming machines is violence — either implicitly or explicitly acknowledging the powers of crossover between digital and material/organic worlds.

Other consumers participate in virtual worlds but find their desires unfulfilled, or at least find them unsustainable. Their initial curiosity satisfied, they look on the games as 'pretty neat', but fail to find these worlds convincing enough to question the nature of their reality or their 'usual' sense of embodied subjectivity. Other aspects of their histories and biographies, other spheres of both digital and non-digital embodiment, remain more compelling and interesting for them.

Alex Stone (Stone, 1994: 37) evokes this position:

Almost Virtual

Put my life on virtual -
they're almost real
these things I feel.

The question is
what book would you do
if you were called on to write one,
right here and now?

I'm not an expert on anything, she
said
it'll be fiction I suppose

We mark our bodymaps
with scars and creases -
elective surgery and stress,
watching TV sits
of our age sets
come and go
flare and die
in accelerated time

real time
staggered time
time zones
and
date lines

Put my life on virtual
it's almost real
the way I feel.

Becoming digital can 'normalise' a digital life, and the process of accessing such a life through complex technologies (Brook and Boal, 1995). At the same time, becoming digital reflexively interrogates what increasingly complex and body altering technical systems mean for the bodies and identities in which 'we' already invest, how we are changed by such technologies, and how we might seek to change them. Virtual reality technologies do not *simply* reinscribe domination, although they can attempt to reimpose the fantasies of rationality, and a universal and coherent subjectivity. Nor are they simply a matter of freedom and transcendence.

The political issue is how women can think about their identities on these terms *across* embodied spaces and the opportunities and constraints offered by 'becoming virtual' for *what* political interventions. As with bodies so with virtual bodies, with spaces so with virtual spaces (Wise, 1997). Patricia Wise (1997) claims that women are 'always already' virtual, and are therefore better equipped to 'colonise' potentially fragmenting spaces than men. Virtual spaces *can* explicitly deconstruct coherent subjects, but that deconstruction is not as 'feminised', nor as unproblematic as some of the cyberfeminists would have it (Squires, 1996). Rather, virtual experiences are a series of complex, power laden negotiations of subjectivities in a range of virtual spaces. The experience of digital embodiment therefore only makes sense with reference to the practice of human embodiment simultaneously 'outside' the digital world; and in non-programmed worlds, embodiment is already constructed and negotiated.

An awareness of such complexity and instability (not only in immersive VR but in other information and communication technologies) prompts an evaluation of the places where VR *is* currently done. Why people might participate in these processes, and how that opportunity comes to be available, are not issues that can be addressed by looking at virtual worlds themselves, or the boundaries of the virtual system. Instead, connections between these sites and others must be explored. How people organise their participation (or resistance to it), and what resources are available to enable (or constrain) that participation in specific locales, are both issues that can only be resolved by looking at the connections between particular virtual worlds, the locations in which they are put to use, and how those locations are socially and economically organised.

My links here are both material and conceptual: on the one hand material, as I want to move beyond the boundaries of the machine to investigate specific locales/ sites of use. On the other hand, those connections are conceptual, as the meaning of virtual worlds — positioned as genres, as games, as art — cannot be wholly addressed through the content of worlds themselves, but draw necessarily upon context. While it is far from clear at this point where virtual realities will meet their ultimate participants — the living room, the VR chamber, the hospital, the school, the workplace or the amusement park — virtual realities are currently embedded in specific places. It is to those places that I now turn.

Section Three

Locating the Virtual

Introduction

When virtual realities are bought and sold, who will profit?

Ann Balsamo *Technologies of the Gendered Body*

The politics of becoming virtual are not simply related to the subjective possibilities and constraints of cyberspaces, or how phenomenological frames of reference construct experiences of virtual worlds in social ways. Rather, the politics of becoming virtual are also caught up with how virtual bodies and identities are inscribed and elaborated through the social locations in which virtual reality technologies are used/ consumed. As Menser and Aronowitz (1996: 13) argue, we can ‘chart the manners in which a technocultural entity or apparatus takes on different functions or produces different effects when it changes milieu.’

One way to explore how these connections are played out in contemporary cultural politics is to examine the extent to which immersive virtual reality technologies are becoming materially embedded in everyday life (or not),¹ and the specific social worlds which are the ground of these practices. In what sites is the process of ‘becoming virtual’ made possible, and

on what already existing social worlds, organisations, institutions and industries does it draw? Who are the actors in these worlds — what publics and industries take part — and what are their stakes in organising and institutionalising virtual systems?

To understand how virtual realities might rework conventional boundaries of body and identity, we must examine the *multiple* contexts in which virtual reality technologies come to be consumed. As Balsamo (1996: 125) argues, *both* programmed and non-programmed worlds are simultaneously cultural and technical constructions. Both are ‘fully saturated by the media and other forms of everyday technologies’ (Balsamo, 1996: 125). As technologies, virtual reality systems are objects which are embedded and articulated as relations between designers, machines and users (Terry and Calvert, 1997). Between designers, machines and users, however, are locales of distribution, and the social relations which attend them. The process of locating the virtual — of distribution and the work of embedding systems at particular sites — lies *between* the work of production and consumption (Featherstone, 1995). These processes of *location* therefore offer insights into technical interventions which change patterns of cultural production and consumption. Processes of *consumption* and how they are organised are crucial to consider in such milieu, as consumption provides the discursive framework and the rationale for the activity that takes place in locations of use. Moreover, it is important to consider how virtual systems are *produced* in such locations, because those that do the work of organising such spaces are attempting to control the meanings and boundaries of the machines in use. Organisations in cultural industries provide the frameworks for how consumptions can take place, and how virtual worlds can be given meaning and contested (Negus, 1998: 363).

The activities of numerous actors intersect to construct ‘the virtual’ at multiple and culturally differentiated sites. While Chapters Three and Four explored how participation in virtual worlds is organised around investments in representation, bodily disciplines and technically mediated genres, Chapter Five explores how this participation is currently located and organised in relatively specific sites. What kinds of sites offer virtual experiences that have already been explored? Who are the participants in social interaction at these sites, and how are the relationships between them organised to make ‘virtual reality’ happen? How does ‘doing VR’ *become* an experience at specific sites? What opportunities for consumption are there, and how are they taken up/enacted? What resources are offered, who uses them, and how? What

cultural, economic and technical relationships intersect to provide the opportunity to participate?

My interest in looking at sites where virtual reality technologies are publicly available arose on the one hand from my own attempts to find a system I could try, and on the other from recurring themes in the literatures I was reading. My overwhelming impression was of attention to cyberspaces rather than interfaces (Benedikt, 1991; Biocca and Lanier, 1992), attention to the boundaries of the machine rather than networks or contexts (Steuer, 1992), and on speculation and futurism rather than a concern to link an analysis of technics/ media with the social sites of its public use (Heim, 1993, 1998; Hamit, 1993). While a number of authors had examined the sensory stimulation provided by virtual technologies in the form of cyberspaces or worlds (Kramarae, 1995; Hayles, 1993), developed accounts of their own experiences (Pryor and Scott, 1993), and speculated on future interfaces, few had addressed where or how these systems are (or would be) instituted for public use.²

In some literatures, those that specified sites described systems in research labs or private firms which are inaccessible to anyone other than specialists or those working for the companies concerned.³ These approaches simply ignore the role of 'context'⁴ when talking about virtual reality technologies. A fundamental question for critical theorists is how, and in whose interests, these technologies will be distributed and used? (Dovey, 1996; Hayward, 1993). What are the organisational and institutional (as well as knowledge based and meaningful) aspects of virtual identities and experiences?

These questions have thus far been addressed by a number of critical approaches. Some have argued that VR systems draw from and reflect already established — 'old' — 'real life' relationships. These approaches sometimes assume or attribute stable and coherent identities (gender, class) and practices (capital), and neglect to account for how these relationships are played out in relatively specific sites (Kramarae, 1995). Some have identified 'new' (bodiless and transcendental) digital identities and experiences, divorced from how the material social spaces of use assist in achieving this (Sofia, 1992).

Still others employing a feminist epistemology have begun to work from a position/ approach to virtual reality technologies which 'casts doubt upon the possibility of a "new" that is not in some way already implicated in the "old"' (Butler, 1992: 6). Balsamo (1996), for example, asks how the notion of the virtual is played out in cultural artefacts which attend virtual reality

technologies — such as the rhetoric of popular media and the contexts available for consumption. These latter approaches to VR (see also Hayles, 1996, 1996a; Kendrick, 1996; Markley, 1996) begin to imagine how the *connections* between the inside and outside of the immersive technical system generate a range of possibilities for configuring and reconfiguring ‘virtual’ subjects. My aim is to explore the *particular* practices through which a number of actors with diverse interests compete and collaborate to institutionalise virtual systems, in publicly accessible forms.

In Chapter Five I examine how virtual reality technologies become embedded in diverse sites, and how particular spectacles and disciplines organise diverse cultures of consumption. The chapter focuses on the connections I established across social milieu while following the connections between virtual worlds and their contexts: arcades and bars, art galleries and education centres. These sites draw on familiar conventions of consumer culture to encourage the consumption of virtual reality technologies via the construction of spectacular spaces and relations of looking, and also by regulating bodily activities into standardised ‘paths’. At the same time however, such spaces offer opportunities to resist the fulfillment of desires on offer. For this reason, social relations between staff and participants in such spaces are conducted in such a way as to encourage consumption.

In Chapter Six, I examine these relations, and how cultures of consumption are created and maintained as sets of economic relations. In what ways are the people in these locales economic actors, and what is the relation of virtual systems to those relations? Who is interested in constructing virtual systems as economic artefacts? And in what sites? How are virtual reality technologies and ‘virtual cultures’ deployed in the service of business? How are those businesses organised, and what implications does this have for the organisation of virtual reality technologies, and the worlds they make available?

As economic entities, locales for the consumption of virtual reality create spaces for consumers and for consumption — and it is to those media carnivals and bodily governments that I now turn.

Consuming the Virtual:

Spectacles, Disciplines and the Politics of Pleasure

Because Reality Sucks:

Here's the deal. Reality has toxic waste spills, transmission overhauls, and bad hair days. Virtual Reality, on the other hand, has nothing but totally fun games played in strange yet stylish headgear. Which would you prefer?

Cybermind *Promotional Poster*

[The] application of virtual technologies, it should be obvious, reinscribes rather than revolutionizes the economic power that advanced telecommunications represents. To make this statement is not to attack the potential of these technologies but to recognize that their content is the previous medium ... that it subsumes and recodes.

Robert Markley *History, Theory and Virtual Reality*

Markley (1996) argues that virtual subjectivities are grounded in already existing technological mediums and social worlds: material and historical (as well as textual/ semiotic and meaningful) relations. If this is the case, then the ways virtual systems are/ become embedded in already extant social worlds, and the new ways they are becoming institutionalised in a number of specific public spheres¹ seems central in any consideration of how virtual subjects and virtual experiences are formed.² What are the similarities and differences amongst the organisation of different sites, and what

configurations of virtual identities and experiences are on offer amongst them? How are conventional bodily and subjective boundaries played out, reproduced and maintained in the local spaces where virtual systems are available and used? Are new conventions created in these relationships, and if so, how are previous social relationships reworked, and what new relationships are institutionalised?

My purpose in this chapter then, is to consider how the construction, regulation and negotiation of virtual bodies and identities are played out in sites which enable some forms of virtual subjectivity and constrain others. I want to go beyond how virtual experiences are generated through human/computer interaction in a technical system, and pay attention to how people come to participate in those systems, and the social contexts of that participation. The focus is on the boundaries across physical and digital places where the systems, stories, modes of interaction explored in the previous chapter are publicly available. This involves traversing diverse sites — art galleries and arcades, bars and museums, corporate and community network servers and ‘edutainment’.

I discuss how virtual realities are ‘framed’. In the process of ‘framing’ life’s experiences through available forms of interpretation and practice (and thereby creating those experiences from available social discourses), individuals implicitly agree to ‘bracket’ some social practices and situations off from others, and set them apart from their everyday worlds (Goffman, 1974). As such, they become ‘liminal’ zones. Such bracketing is unstable, however, because numerous frames are brought to any particular situation. It makes no sense to attempt an enumeration of all possible frames individuals bring to the consumption of virtual realities as they are potentially infinite. Paying attention to specific forms of social activity, though, like the framing processes in play, games and leisure pursuits, indicates common modes of casting experiences in concrete locations. According to Fine (1983: 183), ‘[e]very play world has a set of transformation rules that indicates *what* is to be treated as real and *how* it is to be treated as real within the make-believe framework’ (emphasis in original).³

This chapter is therefore an account of the connections, similarities and differences amongst the sites of VR participation that I encountered. What struck me very early in the ethnographic process were the qualities of places where virtual systems were available for public use. As I encountered these sites, and read about others, I become aware of the diversity of contexts in which VR is consumed, bought and sold as public activities. A range of

different consumer pleasures are constructed in diverse sites. Diverse subject positions are offered through competing technical, economic and cultural practices which can establish new conventions of virtual identities and experiences, and offer a number of different spaces for their articulation. At the same time, these practices also remain shot through with familiar operational categories of identity and bodily practices.

Intellectual interest and bodily pleasure prompted my own participation in VR, and I began slowly to identify publicly accessible sites for the consumption of virtual worlds. Those most common were centres specifically for the *consumption* of leisure and culture — arcades and fun parks, art galleries and bars. When visiting these sites, I asked questions about the kinds of pleasures that are offered in these sites. Who participates in them, and what kinds of bodily experiences and pleasures are consumed? What conventions are employed in that consumption? How do those desires and pleasures draw on already familiar social worlds? What understandings are available to those consuming these ‘virtual experiences’ in leisure sites? How are power relations established, maintained and resisted in these sites by the subjects who create, and are created by virtual reality technologies?

Consuming Virtual Realities

Materials from an ethnography of computing ... show how the design and production of a new entity ... amounts to a process of configuring its user, where ‘configuring’ includes defining the identity of putative users, and setting constraints upon their likely future actions.

Steve Woolgar *Configuring the User*

In amusement arcades and bars, virtual experiences are predominantly positioned as pleasurable leisure practices through which participants are invited to situate themselves as consumers of virtual experiences. If the production and consumption of leisure and pleasure is socially produced and historically variable (Rojek, 1985), then in any historical period what counts as pleasure and experience is the material and discursive effect of the legitimacy, or marginality, of particular bodily practices. At the same time, the constraints of these practices are negotiated by those that participate in the consumption of pleasurable experiences as commodities (Hawkins, 1990: 213).

The locales I visited employed specific (if various) techniques to produce the effects of pleasure in sites coded for the consumption of bodily and cognitive experiences as commodities. What is sold and consumed in these industry sites are not tangible objects, but rather a series of effects: pleasure, entertainment, spectacle, fun and thrills (Hawkins, 1990: 210-211). What makes these effects compelling is the opportunity to rework embodiment and subjectivity through the collapse of distinctions between body and technology, in sites which encourage these boundary crossings. Virtual reality technologies become integrated into the social worlds of bars, arcades and museums, but are positioned differently in each of those sites. The sites shape the ways the technologies are delivered.

Hawkins (1990: 215, emphasis in original) suggests that consumption should be considered

a practice marked by the cultural relations and processes which consumers bring to a commodity *and the conditions under which they use it*. The meanings and pleasure of leisure emerge in the relationship between leisure commodities and their consumers, such that patterns of distribution and reception are as important as the nature of production.

The consumption of virtual realities is where a range of technical systems, different publics and audiences, leisure centre operators, VR producers, local authorities, and state regulatory bodies come together in specific sites, both digital and non-digital.⁴ These locations are situated amongst vast networks of capital industry deployed for the production and profit associated with the construction of pleasurable experiences. Meaning circulates here through representational techniques, but so does money and networks of business organisation, so do publics and their relationships with each other.

Selling experiences as a set of social and cultural effects is not new — the history of leisure has demonstrated that there have always been spaces where ‘experiences’ of various sorts are constructed and consumed.⁵ Often, as in the case of virtual realities, technologies in these sites of consumption serve to alter bodily states, thus constructing alternative bodily spaces, activities and experiences. The activities at Australia’s Wonderland (Hawkins, 1990: 225) for example, at Coney Island or Disneyland (Weinstein, 1992) offer, like virtual realities, a number of different bodily experiences, from rides defying gravity or the laws of physics, to technologies developing specialised bodily skills and knowledge. As Bennett (1983: 147) notes in his analysis of the amusement park rides at Blackpool beach, what is done through the

consumption of bodily pleasures — danger, thrills and the achievement of otherwise impossible states — is to temporarily rearrange bodily boundaries:

suspending the physical laws that normally restrict its movement, breaking the social codes that normally regulate its conduct, inverting the usual relations between the body and machinery and generally inscribing the body in relations different from those in which it is caught and held in everyday life.

The experience of removing the body from everyday life, and the pleasures of its insertion into machine systems, is not limited to the use of technical objects, however. Rather, a range of consumption activities offered at particular sites define how embodied interaction with/in a technical system will be acted out and interpreted.

Goffman argues (1972) that worlds of games and play are ‘framed off’ as spaces where what is illegitimate in other arenas of social life can be played with, become safe and legitimated. The potential for virtual worlds to disrupt a sense of ‘reality’ (which some authors find so compelling) is merely one disruption amongst many in these locations. It is not so much that VR provides an ‘escape’ from reality, but that it provides a temporarily alternative reality (Springer, 1996: 81) amongst a number of such that are embedded in everyday life, but are nevertheless resistant to it (Cohen and Taylor, 1992). Spaces framed for leisure generate completely ‘real’ embodied pleasures, which are attractive because they are already completely fantastic.

These are spaces in which transgressions of everyday life are possible, risks and dangers are played out. Outside urban leisure sites, images of the pleasures inside clearly mark a boundary point, beyond which fantastic pleasures await. Specific mechanisms in the centres themselves create a captive world apart from other spheres of social interaction. Centres tend to have few windows, and no clocks, and so create a time and place apart from everyday life. Another example is how economic exchange and interaction are enacted. The circulation of ‘money’ in sites, already symbolic of the economic, is reworked and replaced by symbolic/ cultural exchanges of abstracted value (Baudrillard, 1980, 1983a).⁶ Cash or paper money is replaced with tokens for games, or game computers process magnetic strip cards or bar codes which are read off for a single bill at the end of a day’s pleasure (see Fig. 5-1). Or, the computers invisibly transfer time, for which consumers have already paid. A single entry fee is charged in art galleries or

edutainment centres, so one is free to wander at will without ongoing transactions for each occasion of consumption.

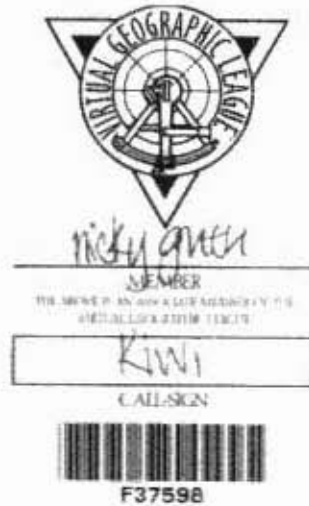


Fig. 5-1
Membership Card
'Virtual Geographic League'
© Virtual Worlds® Entertainment Ltd.

The transgressions that can occur in a social location that is 'framed off' from everyday activities ironically emerge from highly structured physical and interactional spaces. It is in the interests of leisure operators, for example, to organise their sites in such a way as to elaborate and sell the cultural *concept* of VR to promote consumption. Operators transform virtual realities from technical objects/ economic commodities into techno-cultural systems (and vice versa), in the process of integrating virtual realities into particular sites. Virtual reality distributors act, therefore, both as businesses and as 'cultural intermediaries' in a 'culture industry', that is, an industry in which profit-seeking firms produce culture for distribution (see Chapter Six). As a consequence of enacting such (reciprocal/ two way) transformations, consumption activities in these spaces become highly regulated. Sites can be either thematic or diverse, but are constructed around the arrangement of spaces, the activities specifically proscribed and the activities made available. Although the consumption of digital worlds is a primary pleasure in these sites, multiple 'experiences' — both digital and non-digital, emotional, physical, and cognitive — are on offer, thereby encouraging both familiar and new configurations of space, objects and consumption practices.

Scene

I walked through the doors from humidity and an overcast natural light, into a dark gloom punctuated with flashes of light and staccato, machine generated noises. The walls were lined with banks of machines. I didn't want to look too closely at the machines and the people in this alien space. My experience of video game arcades was limited, and I felt that looking around too much would draw attention to myself, it would become obvious that I didn't fit, that this wasn't my world, that I was inexpert (Fieldnotes, Auckland, January 1995).

My own discomfort on entering a video game arcade suggests how individuals are potentially positioned in contradictory ways by the sites of VR consumption. I was intrigued at the prospect of connecting with a virtual reality system, but my social and cultural knowledges did not extend to the conventions of arcade or leisure centre sites. My desires for the pleasures offered at the site described in my fieldnotes above — the tactility of the humid dark, the sense of danger in unknown territories, the pulsing sensory assault of light and sound, the meeting of challenges to bodily and cognitive skills, and the sense of achievement thereby engendered — and my lack of knowledge about the conventions of fulfilling those desires in these spaces, create contradictions which constitute me as an 'uneasy' public. These unstable associations positioned me as both within and without the conventions of consumption in this particular site (Star, 1991).

If I was not familiar with location-based entertainment however, other publics were. Depending on the potential audiences for different sites, experiences are positioned in different ways, and the staff will expect to interact with those publics in different ways. In a *themed* leisure centre, for example, there is a wide range of potential publics. This is the way one of the staff in a leisure centre described those who inhabited this space:

anything from small children all the way up to older people ... people that live in the city, the tourists ... rich people up in the corporate offices that come down for lunch, to people who save all week just to be able to play on the weekend. We have housewives, children, cyberpunks, computer dorks, computer programmers that want to come down and see what new set-up we have. We get a lot of computer programmers coming here and you know, they just [think it's] 'everyday', and then there are people that are just completely nonplussed (Kelly, San Francisco, March 1996).

Arcades were a common place to find Virtuality® systems amongst already well established pursuits such as video game machines. Video arcades are packed full of electronic machines which loom in every available space, are filled with the machines' light and sound effects; signals that the machines

are at work, therefore consumers are having 'fun'. The audiences for the pleasures of arcades are predominantly young men (Shuker, 1995; Provenzo, 1991), and interaction in the game scenarios marketed to this audience focus on physical/ bodily mastery.

The opportunities for men to play out qualities of masculinity (such as 'competitiveness' or 'aggression') through bodily movement in these public spaces seems to prompt some staff, operators and consumers to agree that VR has its highest appeal with men because it requires/ allows exactly this kind of bodily movement. This assumption effectively reinscribes already established categories of gender (Hayles, 1996) and creates a self-fulfilling prophecy. A staff member in a VR themed leisure centre assumes men's 'competitiveness' made virtual realities more attractive to them:

Well, during the day our sales are to a lot of business people, corporate people. I can say a lot of women come in, but I have a lot of men come in as well and they like it a lot more ... they will want to be shooting each other. They're competitive (Christina, San Francisco, March 1996).

An intense and physically active consumption is also encouraged by the physical layout of arcade spaces. When I visited arcades with the prospect of doing observation work, I found there was nowhere to sit down — unless on the floor. Sitting and passing time are implicitly, but effectively, discouraged by the lack of seats. Standing bodies, clustered around machines, instead invites a reading of intense bodily activity, often attributed to masculinity, conveyed to the observer through stance and movement.

In arcade environments, virtual reality systems are one attraction amongst a wide range of other systems, from standard digital video games, to car racing simulators, to wide screen interactive film-based games, including a range of storylines and genres. These public spaces of consumption have long histories, and combine the pleasures of game mastery and skills, of crowds and noise, of imagery and spectacle. They are the contemporary worlds of 'carnavalesque'.

Carnival is not a spectacle seen by the people; they live in it, and everyone participates ... While carnival lasts, there is not other life outside it. During carnival time life is subject only to its laws, that is, the laws of its own freedom ... Carnival celebrated temporary liberation from the prevailing truth and from the established order. It marked the suspension of all hierarchical rank, privileges, norms, and prohibitions ... Carnival was the true feast of time, the feast of becoming, change and renewal ... it demanded ever changing, playful, undefined forms (Bakhtin, 1984: 7-11).

Carnival (and often its 'grotesque' associations) is reminiscent of circuses (Cummings, 1986), sideshows and markets where magic, myth, theatre, desire and consumption come together.

Scene:

A half renovated retail supermall in the centre of London — scaffolding and planking weaving their ways in gloomy half-light amongst the entrances to entertainment centres — a conventional movie theatre, a 3d movie theatre, video arcades. Conversation becomes impossible when drawing close to the perimeters of the dimmed entrance ways: The thunderous volume of the latest rap hit, overlaid with the sound effects of hundreds of gaming and gambling machines erupting simultaneously, is deafening. Crowds gather and scatter, merge and melt into darkened corners where bodies hunch over machines with concentrated intensity. The iron bars across the cashier's window, and the press of bodies declare the space a little unstable, a little anarchic (Fieldnotes, London, July 1996).

Arcades trace their history from the pool halls, pinball arcades and amusement parks which preceded them. Operators talk about their ongoing struggle to challenge the stereotypes held by predominantly middle class publics of arcades as illicit and dangerous.⁷ Certainly, there is a chaotic diversity; arcade pleasures are generally disorganised, garish⁸ and the expression of that pleasure noisy and physically demanding. From virtual realities to video machines to 3-D rides, bodies move/are moved widely in space, to the accompaniment of both machine and crowd noise.

The 'danger' associated with arcades at least partly arises from the way they employ the unruliness of interpersonal relationships to encourage consumption. The pleasures of playing virtual reality amongst crowds of people involves not only the fun of game skill, but the thrills provided by competition with significant others. Games involve intense interaction, competition and direct sociality amongst groups of people, and a symbolic aggression which is out-of bounds in other arenas, but which can be acted out safely in digital fantasy spaces. The pleasures of escape from social mores associated with work or family relationships are central to the late twentieth century subject of leisure: out of work spaces and into spaces coded for the pleasures of 'time out' with family and friends.

Many of the staff I spoke to in theme parks, leisure centres and arcades, described in detail the kinds of relationships they observe while at work in VR retail spaces:

Say six people, that are all friends or business workers, or co-workers, even family, they come in and they'll play games together. It's much more I think, maybe of a rush because you're actually fighting against somebody else that

you know, friends, loved ones, whoever it is, it's much more real (Christina, Interview, San Francisco, March 1996).

Here a 'real' virtual experience is one which combines VR with more intimate and ongoing interpersonal relationships. People are offered the opportunity to situate themselves as 'friends' or 'family', while at the same time fostering a competition which pits them against each other. This underlines the way that VR serves here to establish continuities of interpersonal identity across time rather than challenge those everyday embodiments. In the process, however, interpersonal relations are reconfigured. Affective relationships become digitally mediated, and thereby 'vicarious'. In turn, VR machines become embedded in the relations of friends in groups which are more often articulated in non-digital contexts:

When [people] play against the machine, it's not personal — it's just this other thing that's moving around. I think there's no association ... social association. That isn't transformed into my friend — that's just like the video game — that's something that doesn't really emotionally exist (Kelly, Interview, San Francisco, March 1996).

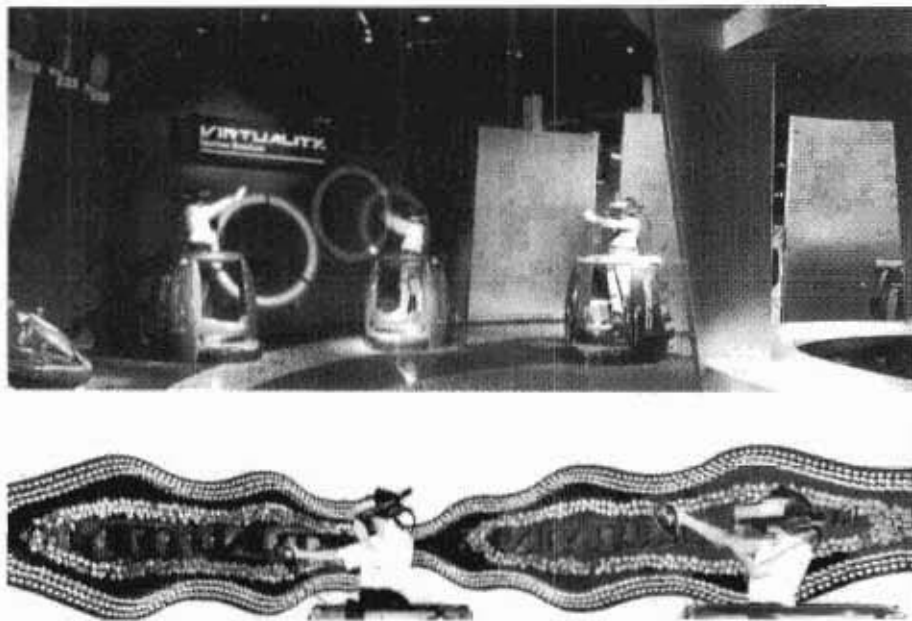


Fig. 5-2
Consuming Social Pleasures
Virtuality® (1993) p. 17.
© Virtuality® Ltd.

One consequence of an intensive and sometimes competitive sociality amongst groups of related people is the sheer mass of simultaneous interaction. People — their physical presence, their movement, their noise

and talk, shouting advice over the noise of the machines, organising the purchase of tokens, offering post-mortems of the games already played, discussing which should next be played — produces a ‘spectacle of voice ... movement and gesture’ (Lynch, 1995: 227). The bodies of other participants become a promise of the pleasures available from consumption, and act to advertise and promote the excitement of consumption in those spaces (see Figs. 5-2 and 5-3).

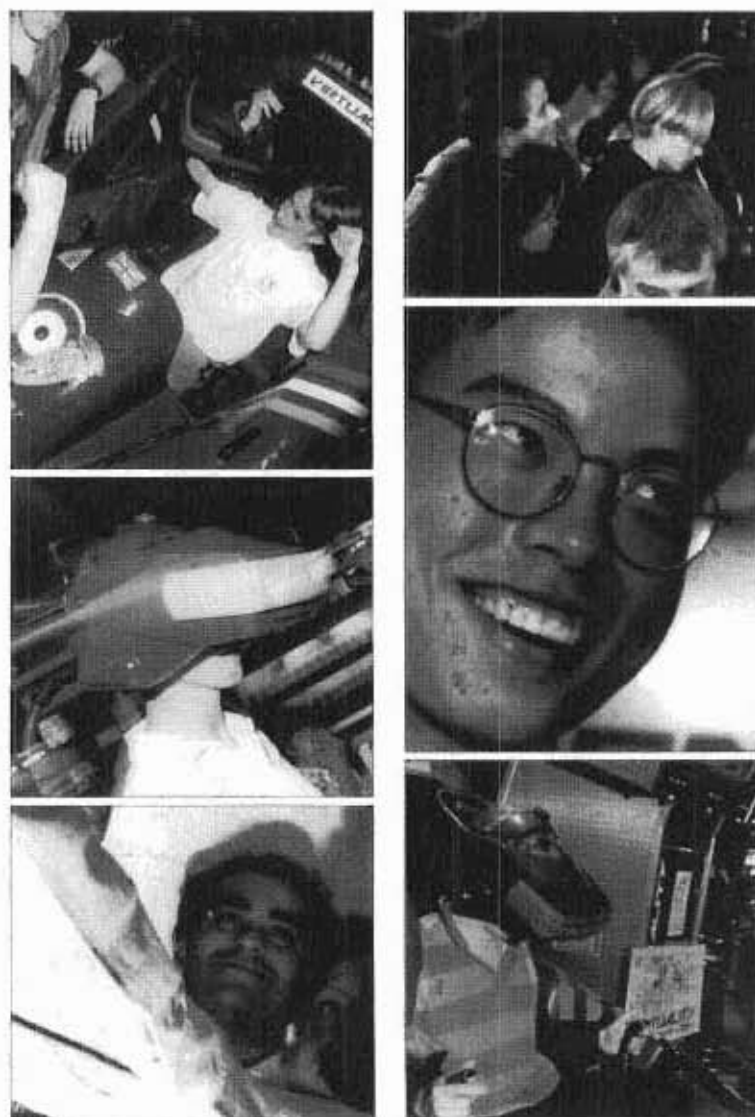


Fig. 5-3
The Construction of ‘Fun’
Virtuality (1993) p. 6.
© Virtuality® Ltd.

The ‘moral panics’ associated with this kind of intensive and competitive spectacle have prompted a reorganisation of leisure sites towards a more

controlled and regulated consumption which finds its most clear and developed expression in the ‘theme park’. Accordingly, what were once video game arcades in downtown areas of cities, are becoming suburban ‘family entertainment centres’, urban bars and cafés, or themed leisure centres. These sites offer pleasures unavailable in arcades with which other publics and audiences — those who would not otherwise participate in ‘arcade’ life — can identify.

Specialising in themed virtual reality experiences produces environments for consumption which, although they share the spectacle of the crowds,⁹ encourage *ordered* crowds and *controlled* spectacles. The prototype of the contemporary theme park is Disneyland (Eco, 1986). According to Weinstein (1992), Disneyland was created as a family amusement park, a clean and safe (sanitised and beautified) middle American environment. The park would focus both on nostalgia for American family values (past) and education in technological progress (future), as well as creating a well-controlled fantasy world of illusion.¹⁰ As Eco (1986: 7) notes, in Disneyland

[t]he “completely real” becomes identified with the “completely fake.” Absolute unreality is offered as real presence. The aim ... is to supply a “sign” that will then be forgotten as such: The sign aims to be the thing, to abolish the distinction of the reference, the mechanism of replacement.

It is, as Giroux (1994: 28) argues, a ‘politics of innocence’, played out through the manipulation of *what counts as* ‘fantasy’, ‘reality’ and experience.

In the same way, themed VR leisure centres create spaces which encourage adults and family groups to participate, and which aim to produce a clean and well-ordered spectacle. They emphasise the pleasures of ‘advanced’ technologies in a highly predetermined, structured and captive world. Strategies which formalise competitive relations illustrate how competitive pleasures become ordered. The machine plays its part by rendering digital interaction material, thus concretising relations amongst people. As one retail salesperson comments:

If you get a print-out at the end it’s like something physical you get to take home that you just paid eight bucks for ... and it’s like yeah, I kicked your butt right here. I got shot four times and I killed you three times. There are people that will come back and say “I’ll meet you here at lunch time” and it gets a little thing going ... a little competition, the tournament thing (Christina, Interview, San Francisco, March 1996).

Leagues are formed, formal tournaments held, with prizes: usually free games to promote the consumption of them. Magnetic strip cards save the game in the computer for a return visit. As one retail manager noted,

Legend Quest was a huge project whereby people would go every week and carry on from where they left off before and it wasn't a three-minute hit. It wasn't a three minute wonder. It was like having hours and hours of game play in there (Ben, Interview, San Francisco, March 1996).

These strategies both facilitate competition amongst groups to encourage repeated consumption, and ensure a continuity of experience across time. In doing so, these digitally mediated relationships provide new economic and cultural spaces to encourage the ongoing and repeated assumption of digital identities. The construction of 'leagues', monitored through magnetic strip cards, and economically managed through the computer systems in the machines themselves, establish an economy of digital/ informational exchange. Consumers thus become more thoroughly rationalised 'information', and are positioned as digital players in the symbolic and value economy of the site: the form of the process echoes its content (Bogard, 1996).

Theming around concepts such as 'the virtual' is an important marketing tool, which attempts to standardise particular forms of VR consumption in specific institutionalised settings. As one theme centre manager in the United States put it, the 'vision' for the VR store he managed

was kind of like the Disney store, where you can just walk into any city ... you'd walk in and you'd know exactly what to expect when you came to [the store]. They'd be dressed the same, they would have the same uniforms, they'd have similar games, same price structure, and it would be just a new big thing in every major city (Ben, Interview, San Francisco, March 1996).

Whereas arcade spectacles employ a chaotic diversity, themed leisure centres intensify cultural concepts and narratives of virtual reality by extending their reach into the 'non-digital' experiences of the sites. The intensification of 'the virtual' as concept and sign is achieved through intertextuality, through the physical concentration of such experiences and the connection between them: theming focuses on virtual realities to the exclusion of alternative experiences of leisure and pleasure.

Theming deploys signs, images, texts from numerous other contexts (such as television or shopping malls), and recombines them, situating them alongside the discourses and practices of VR. The problem for entrepreneurs

then becomes one of deciding what supplementary activities will keep customers in the sites? One retail manager outlined the situation:

Let's say you've got five machines and they're full, from opening to close, 365 days a year, that would be the maximum amount of money that you could possibly can make in that store ... So you need some other way — you need merchandise to make more money. And food or coffee or some kind of beverage-type thing. (A) to make more money and (B) to keep people in the centre longer — its a five-minute game, you go in and play and you leave. You might have fun but you didn't really, go to [the store] to sit in your head as a place to go spend an afternoon (Ben, Interview, San Francisco, March 1996).

One peculiarity of theming is its associated merchandising. Themed leisure centres also become stores in this context, which sell holograms, books (often on 'cyberspace, VR and computers), game disks for home based computer systems (with associated sponsorship for companies), even T-shirts and sweatshirts. Merchandising supports ongoing/ repeated game play by keeping consumers in the location. The merchandise simultaneously comes to be associated with the technology and so extends the activities of consumption associated with 'the virtual' into a range of other social spaces. The concept 'VR' becomes inscribed in merchandise which continues to render a potentially 'mobile' concept 'immutable' in material form (Latour, 1988).

Some centres theme virtual realities as adult and urban pleasures in central cities, which team virtual reality technologies with the familiar pleasures of bars and cafés:

Scene:

A bar/ café in Berlin, where a group of adults sit at a table and sip on umbrella-clad cocktails whilst musing over the immersive experiences displayed high on the ten television screens which surround the pods. A life-size bronze humanoid insect slouches over the bar, and turns its head to make a comment to the man who has momentarily left his web-surfing on the internet connections in the corner to purchase some liquid refreshment.

The retail outlets, bars and cafés which invite one to experience VR are reminiscent of analyses of early metropolitan modernity, and the social practices and identities of everyday life in urban spaces (Ryan and Fitzpatrick, 1996). In this modernity, transitory crowds flowed, changed, melted together. The streets and arcades of the urban centres were symbolic of the ways identities became unstable and fugitive in the pleasures of mass commodity forms (Berman, 1982). VR intersects here with other new

technologies (such as the internet), and the consumption practices of hospitality industries (see Fig. 5-4).



Fig. 5-4
 Virtuality® Café, Berlin
 Courtesy of Virtuality® Café

Through their spatial and physical organisation, cafés require sitting, relaxing, waiting, watching, talking, having a drink and interacting with friends. These spaces and practices are familiar to still different groups from the audiences who are found in the arcade or the theme park. VR is supplemented with further digital spaces and identities in leisure sites which extend and reinforce the sphere of activities which contribute to the process of 'becoming virtual'. These include time spent networking into the world wide web and email, to newsgroups, bulletin boards, IRC and MUDs.¹¹ The activities are configured in ways to attract consumers whose social, leisure and pleasure activities include these activities in other locations, but are deployed in these spaces to (intertextually) support the consumption of virtual reality technologies.¹²

Other sites team 'education' and 'entertainment' which incorporate both VR and the other computer mediated communication (CMC) technologies available in bars and cafés. Just as Disney promoted 'education' as well as entertainment in imagining the future, education is becoming an important

marketing tool.¹³ According to Rojek (1993: 169-170), theme parks such as Disneyland have employed the notion of a developmental education to ensure return visits, and thus 'mass' culture takes on some of those roles of self-realisation previously in the domain of bourgeois 'high' culture: a 'pedagogy' of popular culture (Giroux, 1994).

Scene:

A bustling congregation at an 18th century marketplace building in Boston, Mass. The converted building now houses food halls and antique shops, as well as Cybersmith: a company formed as a business organisation to create venues for the meeting of education and entertainment in computing and new communication technologies. Here, you can try out new computer and virtual reality technologies. The centre is predominantly aimed at children and young adults, although they do the full range from business/office training to children's birthday parties and summer camps, as well as location-based entertainment. A wet day, the tarpaulins which cover the 'outside'/promenade half of the store threatening to give way and cause an electrical short circuit in both the VR machines and the televisions which advertise the experiences.

Cybersmith is an entertainment venue which was specifically created to educate consumers — and effectively create markets — for new computer technologies; not only virtual realities, but multimedia, networked personal computer games, and internet connections (see Fig. 5-5). What Cybersmith adds to this mix is a bookstore — including books on new media and communications technologies and 'cyberspace' — adult and business training sessions, children's birthday parties, and educational 'summer camps', as well as after school workshops.

According to a Cybersmith manager:

The whole premise behind the Cybersmith concept was bringing this technology that's emerging ... to people who — this would not be part of their daily lives. Because it's going to be part of your daily life. It is now whether you realise it or not ... So we have a place we go along where a customer can purchase a Cybercard, which is a membership, and put money on that card ... As part of this concept, [VR] technology is going to be more prevalent in your home ... its way down the road, but the technology's here, so why not showcase it? With that ... its almost like a museum of the future (Jeff Peddle, Interview, Boston, August 1996).

The diversity of consumption possibilities in Cybersmith both provides financial security in the face of uncertainties about audiences, and embeds virtual reality in ongoing social practices of knowledge dissemination. The kinds of identities offered through this knowledge cohere around the opportunities associated with the appropriate skills and information to

participate in an increasingly digital world. Educational centres can be themed around 'the virtual', or VR can serve alongside other attractions aimed at other, more general themes.



Fig. 5-5
Cybersmith Education Concept
© Cybersmith

Science Alive in Christchurch, New Zealand, for example, themes activities around concepts in natural science — such as 'the laws of physics' — but employs a number of different technologies and attractions. Science Alive commissioned two programmers, university Masters students, to develop VR installations. One developed the theme of gravity by programming a world of 'virtual juggling'. The other developed 'virtual music', where air instruments produce music with the aid of a power glove (Presto, 1992).

These sites make explicit what is implicit at other venues — the conventions available through consumption for learning bodily activity and states, digital/ virtual identities. Learning VR is also a process of learning popular culture. The cultural elaboration of digital identities intertextually relies on knowledge of pop culture, while simultaneously reconfiguring pop cultures and identities into a digital future. Obtaining knowledge of the digital by learning VR positions users as competent digital individuals, having familiarity with new media, and participating in technological progress (discourses familiar from Chapters Three and Four).

Art galleries and museums share this conventional orientation towards knowledge production and consumption as the fundamental framework for pleasurable experience. In this approach to cultural consumption, 'experiences' as an 'item' of consumption are associated with the rise of industrialisation and a specifically capitalist and bourgeois consciousness based on middle class notions of personal 'betterment'. 'Experience' becomes a form of moral and ethical work, positioned in direct opposition to the play of 'low' culture. Experiences, and the collection of them are, in this way of thinking, designed for self-realisation, self improvement, an educational venture as a supplement to work activity, broadening the mind (Rojek, 1993). Alongside this vision are the bourgeois institutions of 'high' modernism — institutions like the Banff Centre for the Arts in Banff, Canada, or the Musée d'Art Contemporain, Montréal, Quebec, Canada — locations for the development of contemporary digital and interactive art. These are organisations which act as intermediaries in positioning virtual realities in the arenas of 'art' and 'culture'.

The pleasures in art galleries and museums are constructed as 'urbane', positioned as they are in sites which cater to 'culture' and 'taste'. Audiences here are assumed to be educated, reflexive and critical, which positions the identities of audiences with respect to discourses about 'high' and 'low' cultural value. The Banff Centre for the Arts, which showed Placeholder, the Musée d'Art Contemporain de Montréal which showed OSMOSE©, as well as other galleries which showed the works (such as the Ricco/ Maresca gallery in New York, the 'Serious Games' exhibition at the Barbican Arts centre, London, and The Laing Gallery in Newcastle-on-Tyne) have installation spaces just as spectacular as those in arcades. Whereas in arcades and leisure centres human/ machine spectacles are physically active, loud and bustling, in galleries where interactive art works are displayed, the technical objects take a different form by virtue of the objects being subsumed to the 'work'

which they generate. The objects are selectively displayed, although no less spectacularly. In this respect, galleries both share some of their characteristics with other VR sites, but are also differentiated from them. It is a captive and spectacular world for consumers, but the bodies in the spaces — through muted voices, subtle bodily gestures — generate an alternative environment to sell VR experiences.

The bodies in gallery and museum spaces are regulated through structuring space and time, in contrast to the potential chaos of arcades. Art galleries employ an explicit resistance to the ‘mass’ and ‘carnavalesque’ aspects of virtual technologies in arcades and malls. Participants in OSMOSE©, for example, must call the gallery and apply for a pre-scheduled appointment to participate in the work. The audiences of the journeys are also organised through time scheduling, and the arrangements of space mean that their ‘witnessing’ takes place in darkened rooms, with pre-arranged seating. This organisation of bodies entails a struggle over ‘high’ and ‘low’ culture, to craft a range of meanings and desires around the exploration of cultural categories of self.

What these different sites/ locations share across the struggle over high and low cultures is a studied organisation of physical and social spaces which foreground the pleasures of virtual experiences as experiential commodities. These relations position subjects as actors in a spectacular consumption designed by culture industries to encourage use, and therefore payment for machine use. These different pleasures — competitive sociality, eating and drinking, buying merchandise, knowledge as pleasure, the development of ‘cultural capital’, as well as mastery and skill — render virtual realities familiar and make them accessible for mass consumption, at the same time that it configures the consumption of technically mediated experiences in new ways.

The consumption of VR across different sites follows the familiar ways that technical systems are already organised as part of an industrial complex vis à vis computer (and video, television, consumer electronics and information technology) industries, which already draw on the stories of digitally mediated selfhood (and how they are enabled by consumption) as a rationale for technical research and development. In all these sites, the machines and their contexts are put together in such a way as to promote an ideal, technological self as a participant in the construction of advanced technology (which is simultaneously already inevitable). VR positioned as ‘high’ culture is the attainment of the enlightenment project worked through technology

(Penny, 1994), and its parameters of control of behaviour, over nature (in the 'biological' self): a sublime transcendence. VR in the discourses of 'mass' culture replaces the project of enlightenment with an awareness of the simulation of the technical self, but a self which nevertheless 'escapes' the rigours of life in contemporary societies: an imaginary transcendence.¹⁴ These sites combine these discourses in different ways. OSMOSE®, for example, constructs electronic space as a return/ escape to the 'natural' while simultaneously deploying elite technology in the service of 'high' art. As Balsamo (1996: 122) argues, the epistemological and cultural challenges presented by VR (and introduced in Chapters Three and Four) are intimately tied to the location of VR in information technology industries — which I draw out in Chapters Seven and Eight. The discourses of technical mastery and progress, and the simulation of selfhood, are both available to consolidate familiar and new/ transfigured social activities in the service of an already entrenched consumption of leisure and pleasure.

While the bodies that inhabit different consumption spaces might therefore be diverse, and the investments they bring to the sites multiple, participants are also situated in common ways by the cultures of consumption generated in a range of sites. The technically mediated 'freedom' of VR is an unevenly distributed freedom to buy, but that freedom 'equally' produces participants in sites *as* consumers. While sites produce the semiotic/discursive *effect* of multiple choice of glittering diversity, VR products as well as organisational relationships at sites are often standardised.

Consumption, however, is a difficult practice to control. While 'the logic of profitability dictates that the sale is more important than the use of a product' (Hawkins, 1990: 215), what one *makes* of the products of culture industries in everyday life is unstable (de Certeau, 1984), which in turn renders the exchange value in such circulations precarious. Diverse sites produce a range of consumption activities which in turn provide a range of ways for participants to become virtual. From the structuring of space and time of relational possibilities, to the kinds of food, drink and environment provided, 'becoming virtual' becomes a *range* of processes in different locales. Participants *play* with the resources available in sites of virtual reality. Some of those resources are the techniques of spectacle which encourage participants to take up virtual subject positions created by consuming VR. There are specific and competing techniques of *spectacle/ imagery* and of physical *discipline* across different sites which position consumers in

sometimes contradictory ways. Those spectacles and disciplines produce new audiences for new and marketable technical products.

Spectacles and Disciplines

The whole life of those societies in which modern conditions of production prevail presents itself as an immense accumulation of spectacles. All that was once directly lived has become mere representation.

Guy Debord *Society of the Spectacle*

Expected publics (familiar audiences) frame how virtual reality spectacles are arranged in consumption spaces, and how industries attempt to entice more customers. Familiar bodily conventions, activities and regulations are employed to reappropriate 'risk', to make the space of VR consumption mundane and not too fantastic. Old audiences are drawn in and new ones created through the tensions between familiar and new practices. The conventionality of public leisure spaces underlines the ways that the fantastic is progressively becoming more mundane, at the same time as 'everyday life' is, through the mediation of the world, becoming mundanely spectacular (Rojek, 1993).

The sites I discussed in the last section draw on different conventions of semiosis and imagery to create their spectacles. Across sites, there are shifting economies of pleasure. On the one hand, the diversity of different spectacles, both within and across sites, offers freedom of choice, expression of individuality in reading and writing it. Consumers employ tacit cultural knowledge of intertextual images to create pleasure and fun from the spectacles. At the same time, it works on a logic of simulation which subsumes diversity to a spectacular consumption of simulation. In a related process, the body becomes the object of techniques of power and discipline, the effects of the desire produced by the spectacle.

The pleasures of the social worlds in sites are defined through the ways definitions of pleasurable experiences are realised.

Scene:

An up-market retail space in a downtown San Francisco shopping centre. The marbled tiles of the mall give way to the polished wood flooring of a showroom, the machines arrayed behind the solid glass frontage inviting escape, promising experiences of the (computer-generated) sublime. The haze of traffic noise gives way to the (very muted) sound effects of other worlds as

the machines gradually and quietly surround those who venture amongst them.

Just as the dominant mode of perception and relation in digital worlds/stories/ genres is visual, sites of VR consumption are organised around relations of *looking* (Hillis, 1996; see also Bukatman, 1995; Boddy, 1994, Crary, 1990) The perceptual stimulation offered through embodiment in/with a VR system is not the only visual 'experience' on offer in VR sites. In my fieldnotes about my experiences with virtual realities, for example, I was highly conscious of being watched, even as I played:

I was acutely aware of being watched, potentially by all other eyes in the room. The knowledge that I was being watched by a few, and the sensation of being watched by many, was ironically reinforced by not being able to see whether anybody was watching at all. My body was elevated in the pod, raised and differentiated from others. This space offered others the opportunity to watch me and evaluate my performance; both within the digital world, and the action of my body in 'real' space (Fieldnotes, Auckland, January 1995).

When participants become VR consumers, bodies in crowds (as well as technical objects and media images) are translated into a digitised/informational spectacle. When people are put to work as advertisements for experiences, watching and being watched become licensed, and relations of 'the gaze' are inevitably assumed (see Fig. 5-6).



Fig. 5-6
Relations of the Gaze
Virtuality (1993) p. 17.
© Virtuality® Ltd.

Digital mediation intervenes in visual relationships, and produces contradictory forms of looking. On the one hand, there is self-surveillance produced by identification with spectacular bodies in sites, and the desire to become one of those bodies. On the other hand, spectacles produced via media which transmit images of simulated realities provide reassurance (in

the face of the dangers of human/ technology connection) of a ‘panoptic power — the human subject [is], after all, capable of perceiving and comprehending the new conditions of physical reality through the projection of an almost omnipotent gaze out into the represented world’ (Bukatman, 1995: 255).

Relations of looking are not necessarily good for business — it can be uncomfortable for consumers. As one production manager notes:

A lot of people buy VR systems because they want to create a big attraction. And in making the attraction, it means a lot of people look at the system and the person who’s playing it. A lot of people don’t want to play VR because they know they’re going to become the centre of attention on a pedestal blindfolded, so there’s a bit of a conflict there. So how do we make an attraction that draw attention a little bit away from the player so they don’t feel so exposed? (Martin, Interview, Palo Alto, September 1996)

The elevation of the bodies of players physically produces what Foucault argued is a widespread construction of the subject in contemporary western societies — the ‘self-surveilling’ subject. Foucault’s work on the prison (1979) and the clinic (1973) emphasised how relations of looking are institutionally organised to generate this position in power relations, a subject whose desires are produced, and whose body is disciplined and regulated by their own assumption of an all-encompassing gaze — the gaze of the ‘panopticon’. In VR, the form of the technology which renders subjects permanently visible creates bodies as objects of surveillance techniques. Bartky (1988) argues that women have historically been more subject to the disciplinary practices of the gaze, and so that gaze has tended to produce gendered effects.

Rose (1993) has also argued that the occupation of public space can be a fraught process for women in particular. For me, it intersected in troubling ways with notions of mastery and control in my performance vis à vis the public practice of skilled masculinity and the dominance of men in retail sites.

There are, however, pleasures in looking and being looked at. There are, for example, the pleasures of publicly demonstrating competence in a virtual world projected as entertainment for others. While looking is inevitably gendered and sexualised, especially in the ways that the technical and public is associated with masculinity and the ‘disembodied’ mind, and femininity with organicism and private space, these are not stable categories — they shift with context. All social subjects are positioned by relations of looking

through media in contemporary societies — what differs is how one looks. Laura Kipnis (1993) suggests that there are ways of looking other than the positions outlined by Laura Mulvey (1975), who first asserted that masculine subjects constructed relations of looking which position women as ‘objects’ in the conventional representations of film (see also Kaplan, 1984).¹⁵ Alternatives to ‘the [objectifying] male gaze’ draw on the spaces of the city, the modern metropolis. Baudelaire’s *flâneur* (Benjamin, 1973), the ambiguous dream spaces of Benjamin’s ‘arcades’ (Buck-Morss, 1989; see also Boyer, 1996), or Simmel’s ‘metropolis’ (Frisby, 1986) were urban sites and identities where the chaotic, the contingent, the ephemeral and the new piled vision upon vision in public space in the service of commodity consumption. These spaces, constructed through relations of looking, do not rely on the objectification of others for their subject formation. Instead, they both call on, and reinforce, existing modes of media and leisure consumption such as the spectacles of crowds in shopping malls (Ferguson, 1992; Langman, 1992), or the banks of television screens advertising movies in multiplex cinemas.



Fig. 5-7
The pod, the futuristic mannequin, the screen...
Auckland January 1995
Photograph: Nicola Green

While the form of the artefacts position consumers as self-surveilling, the technical artefacts work both as objects and as signs for themselves (alongside multiple television screens and human bodies). They are a novel visual pleasure. In location-based entertainment centres, the VR machines can be read as texts which advertise the high-tech science fiction pleasures of virtual realities (see Fig. 5-7). As technologies, cultural texts and commodities, the design of virtual reality technologies simultaneously embodies both the cultural and the economic. As Fry (1988: 69, in Hawkins, 1990: 219) notes,

[t]he economic product and process is knowable only through cultural appearance, as a sign. The market-place is both a social and economic location of exchange. Within it objects as signs are fused, as commodities, and exchanged in conditions of economic and cultural power/ meaning/ knowledge.

The form of the machines and their arrangements in space are constructed in such a way as to emphasise technically determined human development and progress. Their physical manifestation, their size and their more or less prominent location in specific spaces contribute to the ultimate 'seriousness' of VR. The form of artefacts such as Virtuality® machines is reminiscent of other texts which draw on discourses of technical progress and human/machine fusion, and which invite utopian responses centred in the suppression of 'nature' and 'biology' and the celebration of the cybernetic interface. The enclosing pod of black, sleek plastic, the head mounted displays and prominent cabling, connect referentially with science fiction texts such as the 'Borg' in *Star Trek: The Next Generation* (Fuchs, 1993, see Fig. 5-8), signifying infinite technological progress and expansion, and the frontiers of human/computer relations where human/machine hybrids are created.¹⁶

This freedom associated with a captive and science fiction fantasy world however, gives way to the immediate practicalities of how to connect the physical bodies of consumers with the machines. This is ultimately achieved through interactions which are firmly embedded in disciplinary mechanisms, performed amongst actors/ participants, and maintained by them. These practices are extensions of those material disciplines discussed in Chapter Four which are specific to virtual reality technologies as a socio-technical system. They are also, however, specific bodily disciplines which emerge from the social worlds of leisure spaces.

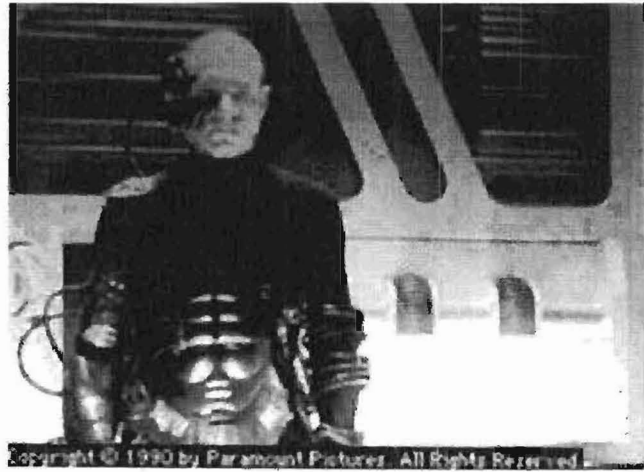


Fig. 5-8

Picard as 'Locutus' Borg

[http:// www.startrekcontinuum.com/startrek.asp](http://www.startrekcontinuum.com/startrek.asp)

Photo 18389

The Best of Both Worlds: Part II

© 1990 by Paramount Pictures. All Rights Reserved

Some bodies are regulated in consumption spaces by excluding them from the use of the machine. These exclusions articulate with already familiar rules which attend leisure sites more generally. There are rules which serve to protect the machines from the 'unruly' — the instability and contradiction to which humans, as both biological and social beings, are prone. Human bodies engage in biological functions such as eating and drinking, or running close to the machines, thus potentially jeopardising the machines' functioning. So no eating and drinking is allowed next to the machines. Some bodies are also denied access to arcade machines at specified times; in some arcades I visited, those under the age of fifteen are excluded during school hours.¹⁷

These conventions are accepted as such by all parties because they are familiar and already in operation elsewhere, and the rules are often cast for the human, 'public' (physical and social) good. Behavioural regulations are, however, just as likely to be implicitly assumed, whether through the spatial and temporal location of the site itself (downtown or suburbs, opening hours), or through the audience it advertises to — (wholesome) 'fun for all the family'. The careful monitoring and regulation of human behaviour in sites achieve the effect of fitting humans to the norm of the machines — what kinds of cyborgs are being created here?

The system itself as a technical bio-apparatus participates in the process of regulating consumption behaviour, both organising 'appropriate' consumption activities, and defining which bodies are able to consume. The

machines define what bodies can be part of the New World Order (Haraway, 1997), while also encouraging the idea that everybody can consume equally. Manufacturers of VR products, for example, provide safety guidelines displayed both on the machines, and on adjacent signs in leisure sites. A large and prominent sandwich board next to a game in an Auckland leisure centre announced:

WARNING!

DO NOT PLAY THIS GAME IF YOU:—

- ☐ Are less than 110 cm tall
- ☐ Are pregnant or may be pregnant
- ☐ Are under the influence of alcohol or drugs
- ☐ Have high blood pressure or heart ailment
- ☐ Have neck or spinal pain
- ☐ Have eye disease
- ☐ Need assistance when walking
- ☐ Have experienced muscle twitches, loss of awareness while watching TV, playing video games or being exposed to strong light stimulation

Before Game

- ☐ The MVD (Mega Visor Display[the HMD]) is to be used without eyeglasses. This may cause difficulty in focusing for some individuals
- ☐ Some hairstyles may keep the MVD from fitting properly
- ☐ Please wipe off any perspiration before putting on the MVD
- ☐ Please refrain from playing this game without a break

During Game

- ☐ If you experience dizziness or discomfort while playing this game, immediately discontinue play
- ☐ In case of mechanical difficulties, please call a nearby attendant

After Game

- ☐ If you experience eye fatigue, drying of the eyes, flickering or dizziness after playing this game, be sure to rest until fully recovered
- ☐ Do not drive automobiles immediately after playing this game

Replacing the MVD

- ☐ When replacing the MVD onto the holder, insert the MVD firmly until the red light goes off

ATTENTION

The MVD is a sophisticated piece of machinery. Please do not hit, drop, pull or otherwise damage the MVD

The signs point out how humans should interact with the machine, including the appropriate use and handling of artefacts. Specific bodily states (such as epilepsy), and particular gendered states (such as pregnancy), are either excluded or regulated by the bio-apparatus. These transgressive states, outside the categories of 'normal' defined by the form of the technology, are marginalised through their explicit exclusion. When these bodies do participate, they cause uneasiness, and challenge the categories defined through normalising practices at the sites:

One time this guy came in, and his wife with him, and his wife was very pregnant and she was playing — which, I was concerned about but, you know, I kept an eye on her. They got out of the game, [and] his other friend was very upset at him that he kept killing his wife ... and child shooting his wife and child over and over, I guess ... (Kelly, Interview, San Francisco, March 1996)

This scene is disturbing in context for participants in the sites not only because it crosses the boundaries of 'appropriate' consumers, but also because it challenges assumptions about appropriate behaviours for masculine and feminine bodies as defined through specific bodily states and practices. The most disturbing feature for the man's friend was not the 'physical' risks associated with her pregnancy, but the symbolic significance of the continual shooting, which also seemed to disturb Kelly, as she remembered and related the incident. Here, femininity is defined through pregnancy, rendering her engagement in digital technology — which might be dangerous to herself and therefore her child's health (although how is not specified) — is inappropriate, especially as she is playing a competitive game through it. Masculinity is equally defined by bodily actions, and an inappropriate masculinity is one which 'shoots' his pregnant wife — potential mother and potential child. Cyborg bodies are obviously not pregnant bodies, and cyborg bodies are also highly gendered.

The spectacles and disciplines which attend OSMOSE©'s installation are somewhat different to those which attend arcade games such as *Dactyl Nightmare* or the *Sega Game*. OSMOSE© is constructed in its installation spaces through various arrangements of rooms, technical artefacts and people. While the central focus of OSMOSE© is the creation of an immersive experience for an individual participant, audiences also participate in the

work by becoming ‘vicarious witnesses’ of the immersants’ journey. An immersant’s connection with VR artefacts takes place in a small room, adjacent to the remainder of the installation space. That main installation space consists of a larger darkened room, with central minimalist space for seating. This space situates an audience for the immersive work, an audience who ‘witness’ the immersant’s journey ‘in real time’ through a viewing screen, viewing in 3-D stereoscopy with the aid of polarised glasses, and hearing 3-D sound (see Fig. 5-9).

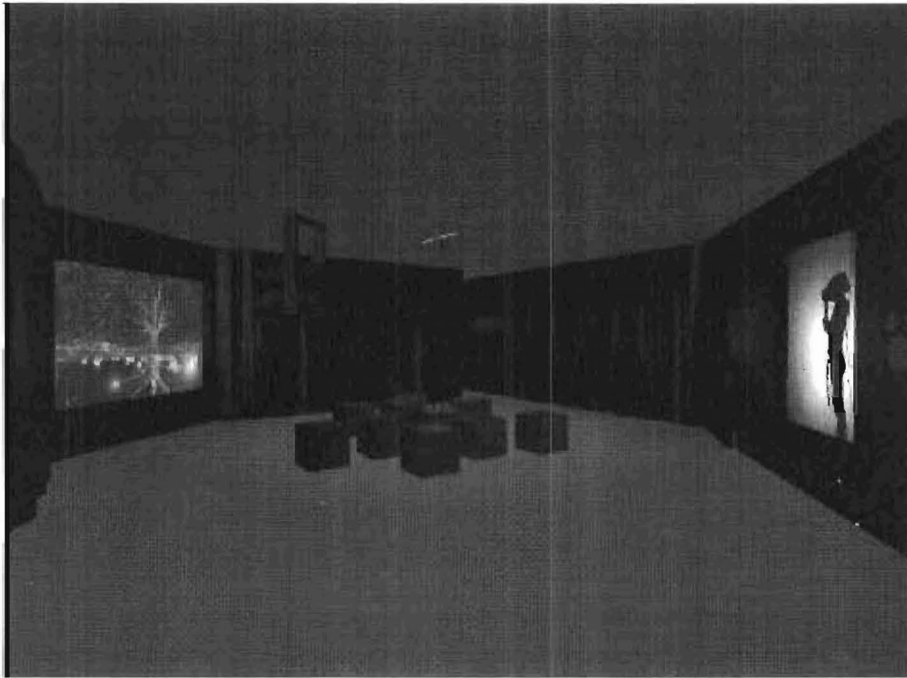


Fig. 5-9
 OSMOSE© Installation Space
<http://www.softimage.com/projects/osmose>
 OSMOSE: Author Char Davies
 © (1995) Softimage Inc. All rights reserved.

In Placeholder, a similar effect is achieved rather differently. Two people participate in Placeholder simultaneously, and their connection with technical artefacts is situated in the centre of a gallery installation space in Banff. The participants are separated from their wider audiences simply through the use of circles of riverstones at the boundaries of their available space (the intersection of high ‘technology’ with ‘nature’). Their point of view is monitored through a media screen which can be viewed by general audiences who are also watching the participants as they explore the world (see Fig. 5-10).

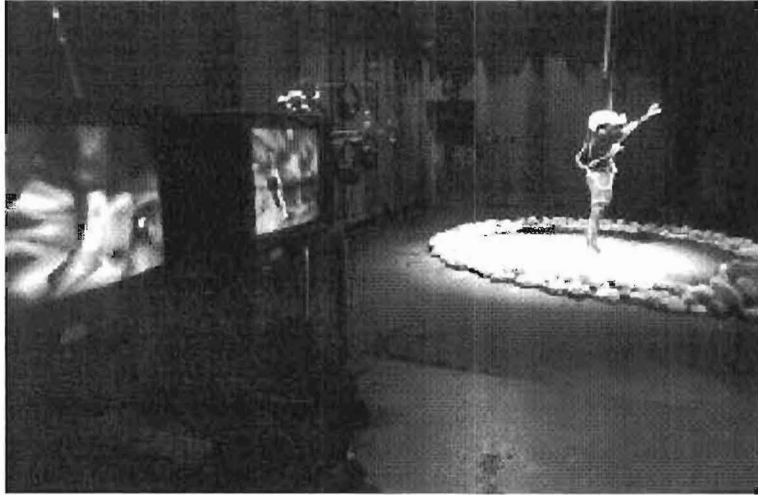


Fig. 5-10
Placeholder Installation
[http://www.interval.com/
projects/placeholder](http://www.interval.com/projects/placeholder)
© Interval Corporation

In OSMOSE©, the imagery of bodies connecting with technologies have a slightly different role to play than arcade imagery, no less spectacular, but more muted (see Fig. 5-11).



Fig. 5-11
Shadow of the 'immersant' in OSMOSE©
[http://www.softimage.com/
projects/osmose](http://www.softimage.com/projects/osmose)
OSMOSE: Author Char Davies
© (1995) Softimage Inc. All rights reserved.

In OSMOSE©, an immersant's connection with the technologies — only one selected from a wide potential audience who vie for the limited spaces available — takes place in a small room which houses the technical apparatus. This room is connected to the remainder of the installation space through a transparent screen, on which the silhouette of the immersant is projected through backlighting. The physical body of the immersant, and the trappings of the technology such as the head mount and cables, is rendered as a 'poetic element' to be viewed by others.

The spectacle of the body connected to the machine is an aspect of the imagery of technology in OSMOSE© through which seated audiences view a cyborg body (and resonates again with the figure of the 'Borg' in Fig. 5-10). While the body of one participant is on view (unlike the arcades, the participant cannot see the audience), the audience are given license to watch and identify with human connection to virtual reality technology. As the backlit image of the immersant is projected for an audience, the human figure in the bio-apparatus aestheticises the bodily disciplines required to wear the (sometimes heavy and physically constraining) apparatus.

The novel spectacles of OSMOSE© lie in these poetic elements, and reinforce the head mounted display and its trappings as the icon/ signifiers of technical progress into alternative realities. As is the case in the arcades, this participation is also the process of learning new technology and new bodily movements. The staff that apply the apparatus to participants and demonstrate how to move are generating both a spectacle for vicarious audiences and newly 'docile' bodies (Sawicki, 1991) subject to technical interventions. In the case of OSMOSE©, however, the art work is extended to draw in as many consumers as possible as it becomes visual, revealing, spectacular to a wide audience in ways that the individual storylines of participation do not encourage. The installation spaces are thereby extended, but the experience of becoming virtual is one of bodily 'passivity', in contrast to the immersant's 'active' and 'interactive' experience.

It is not only machines and the spectacles of interacting bodies which act to discipline participants through the orders of the spectacle: VR sites are heavily saturated with other media images. The virtual experience accordingly includes the interpretation of a number of advertising and marketing images and texts which frame that experience before the player even engages with the machine. This can be achieved in different ways. Billboards outside retail spaces evoke the experience — the outline of an individual wearing a head-mounted display articulating with more

generalized popular media texts to denote the crossing of boundaries to another world. Inside, multiple images, including advertising, position digital worlds as other.

In the Digital Realities centre, advertising for virtual reality experiences — and by extension the experience of the space itself as a leisure centre — surround the potential participant. The legend cited at the beginning of the chapter — ‘Because Reality Sucks’¹⁸ — was not only text-based. The text was accompanied by a prominent logo, and the image of a woman. A variation on this poster in the form of magazine advertising is included in Fig. 5-12.

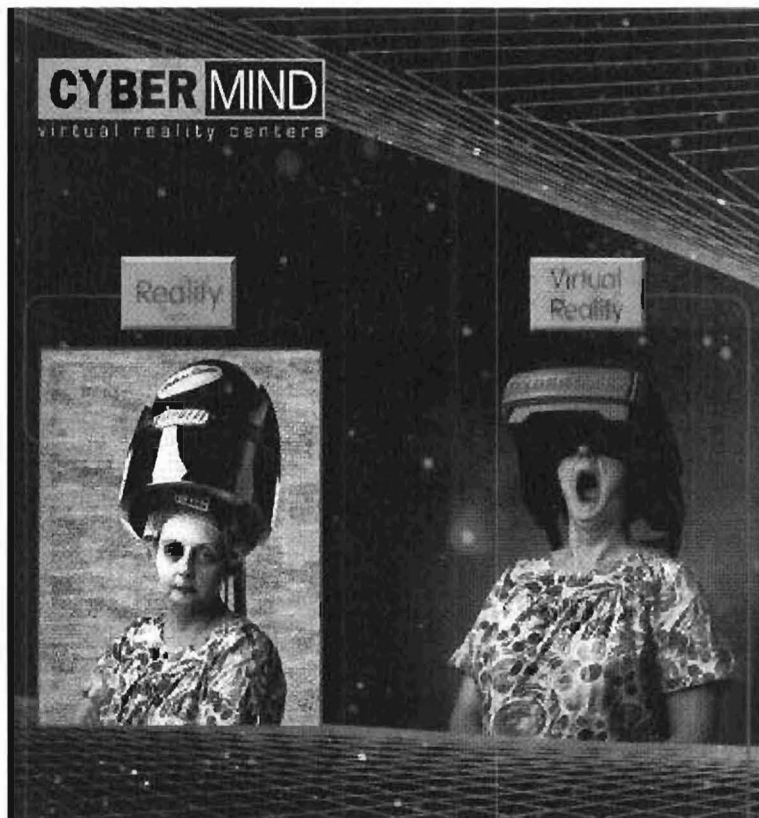


Fig. 5-12
‘Because Reality Sucks’
Mondo 2000, (1995), p. 25
Courtesy of Mondo 2000

The image displays two ‘takes’ on an older woman in a floral print dress with her hair in curlers. In the first take she has an elderly hair drier poised over the head of her slouching figure, and looks both bored and dour. In the second take she has on a head mounted display. Her mouth is now open in astonishment and excitement, her body springing upwards. It is relevant to note here that such texts and images provide a visual discourse of ‘progress’.

Rosalind Williams (in Bukatman, 1995: 282) notes that these articulations signal 'a retreat from technology into technology.' Bukatman (1995: 283) further argues that this incorporates a 'phantasmagoria of progress' which 'involves a sustained immersion within an artificial environment that suggests technology's own ability to incorporate what it has generally excluded.'

This progress is rendered accessible to consumers through viewing other media in sites, which display and explain what is happening in the digital world created by the systems. As a standard feature, Virtuality® units have television monitors which can be arranged adjacent to the 'pod',¹⁹ which are designed to interpret both the digital world, and make sense of the 'real life' actions of human beings participating. In retail location-based entertainment centres then, monitors display the points of view of any participants in the game at the time, and promotional 'videos' provide ongoing images of what the game looks like and how it could/ should be played. These scenes from the experiences they advertise are played continually.

These media serve to encourage consumption by providing a 'prebriefing'²⁰ which familiarises the participants with how the technical objects work, and the human role in the system. These prebriefings provide a clearer and faster image of the digital world (images in 'real time' tend to be slower and have less resolution)²¹ so that participants can 'accurately' interpret the digital images of the world, and also introduce them to the storyline and the identity of the character they will 'be' in the world. These previews, played on television screens before the games begin, specify the bodies that participants are 'inhabiting' when they go into the game, and what their body should look like and do while it is playing the game. A manager in a production firm argued that

We've learned that you must have a large monitor displaying what the experience is all about to attract people to play it. You must make it completely obvious what it is you have to do — a lot of these things don't exist in our current product but we believe in order to sell an awful lot more products, we need to start addressing those issues (Martin, Interview, Palo Alto, September 1996).

Clearly, the ways consumption is carried out is an important issue for the manufacturers of VR products, as well as for those who distribute them. Such a discourse of 'products', of the economic organisation of virtual systems as commodities, and the nexus of relations between consumers and producers, through the mediation of operators and their sites, is the subject of the next chapter.

Conclusions

In contrast to the rhetoric of freedom and transcendence attached to cyberspaces, the sites where VR is consumed regulate their pleasures, actively moulding subjects to the requirements of both the machines, and the efficiencies of the commodity system as expressed in spectacular consumption. The everyday practice of VR requires the deployment of familiar technical, economic and cultural systems, configured in new ways, for participants to learn a new form of consumption.

The organisation of media, objects and people around the social relations of display and looking, produces effects which position the pleasures of virtual reality technologies as a public spectacle *of* and *for* commodity consumption (Debord, (1967) 1995).²² According to Kipnis (1993: 21):

the 'spectacle' is the commodified form of the image. Like the commodity, it disguises what it really is — relationships between persons and classes — into an appearance of the objective and the natural. The spectacle is the capitalist colonization and monopolization of the image; it subjugates people to its monopoly of appearance and proclaims: "That which appears is good, that which is good appears."

Consumption of the spectacular is intertextual (Kinder, 1991), a circulating economy of commentary on itself. Meaning is created across different texts, media and activities, which are related to each other via commodity production and consumption. As Baudrillard (1980, 1983) has noted, a system of signs, of simulacra, has replaced a system of objects, replacing 'reality' with 'hyperreality'. Signs no longer have any necessary connection to a 'real world', but rather the reference of signs to each other constitute the 'real world'. It is not the case that there is a surfeit of meaning in these images, but rather that there is too much. These spectacles are simulations in which the meanings of signs derive value from each other, and their value lies in how fast and how far they circulate.

Through the desires and pleasures associated with familiar bodily practices, as well as through novel ways of doing embodiment in social worlds, materially and historically located networks of practice make a range of virtual (both 'digital' and 'material') subjectivities available in these sites. It is difficult, however, to see how the compelling elements of media and leisure spectacles are negotiated and/ or resisted by those that consume in sites of VR distribution. The way dominant discourses are coded into the desires of the

spectacle, the ways virtual embodiment is regulated through the crafting of social activities, the ways that the economic system operates through exchange value, through the interactions that promote the commodification of desire and pleasure, through the invitation to learn VR, and the regulation and instruction in how to use it: through all of these measures, social subjects are positioned specifically as VR consumers. These means create the desires appropriate to continued consumption.

Assuming or taking up a range of identity positions is a fraught and contradictory process for participants. On one hand, the spectacles provided for consuming subjects, and the way these spectacles are played out in sites suppresses the diversity of bodies and the identities participants bring to the sites, and subsumes them in a logic of simulation, in a re-representation of the same through diversity. This is not only achieved through the desire to identify with a number of potential images and interactions displayed, but also through the explicit disciplines and regulations of the sites. Both desires and disciplines suppress diversity to 'the virtual', but because VR is situated amongst other pleasures, and because its cultural narratives are more widely familiar than its occurrence as a specific technical form (at least at the arcades), bodies resist being defined as virtual. On the other hand, the range of social activities offered suggests that attempts to position subjects specifically as VR consumers, and to regulate consumption behaviours, are always partial and meet with resistances. Potential consumers talked to me about their decisions not to participate more than once. Exchange value is always relative, and some potential consumers chose not to participate as a strategy of resistance. Those that operate centres of distribution are sometimes unsuccessful in their production of the desire to be digital as a new sphere of consumption.

It seems that the disciplines associated with the intersection of technics and consumption practices are crucially *economic* disciplines which, while producing different experiences, also work to extend the reach of those experiences as commodities. This also extends and maintains commodity consumption in other spheres. The negotiation of virtual realities as both technical objects and economic commodities (and the forms of subjective investments enabled by them) is played out through the presentation of virtual systems as cultural artefacts — forms of material culture. The technical and economic forms these objects take depend on their cultural elaboration and organisation in a struggle across combinations of the familiar and the novel, high and low cultures, the spectacular and the mundane, and

the categories of body and activity which variously cohere around these struggles. For all the spaces they open up to explore different forms of subjectivity, the technologies do not initiate new forms of social organisation. Rather, virtual systems become embedded in and reinforce already existing forms of subjectivity grounded in commodity consumption.

Commodities are both configured by, and reinforce, different ways of organising practices of economic exchange. The range of identifications made available through virtual systems are formed through these institutionalised and embodied ways of interacting around commodity objects, the values attached to them, and the signs surrounding them. The systems I have looked at produce a range of different subjective and experiential effects depending on how the systems operate as embodiments of operational economic models. It is to these models, and the ways they are organised and operationalised, that I turn to in the next chapter.

Selling the Virtual:

Objects, Commodities and the Politics of 'Culture Industries'

I mean that's what this is about after all. It's making money. How many people can you get through the system in an hour and how much money can you get off them for doing it?

Martin *Interview, Palo Alto*

Even in its most carnivalesque forms, social exchange is marked by economic exchange ... [T]he commercial exists in a tense dialectic with the festive and carnivalesque aspects of leisure. There is no permanent equilibrium by which commercial interests succeed in mastering, directing the carnival. Rather an ongoing and daily struggle is waged between what are opposed interests and purposes.

Rob Shields *Spaces for the Subject of Consumption*

Inescapably and everywhere in sites of virtual reality consumption is the patently obvious fact that virtual worlds and experiences, as well as the pleasures of leisure spaces, are for *sale*. Experiences, selves and technologies are bought and sold in systems of material/ economic circulation such as 'markets', as well as in systems of cultural and symbolic exchange. Rob Shields (1992) suggests that spectacles of consumption, and the perceptual and bodily disciplines required to achieve them, exist in tension with forms of

socio-economic exchange which are designed to maximise business or productive goals by regulating those spectacles.

Chapter Five explored how consumption relations are organised through the control of the social, spatial and media spectacles which encourage desires to consume, and the regulations concerning the use of machines which organise the (partial) fulfillment of those desires. So far then, I have concentrated on the effects produced by relationships between the consumers in sites, and the various technical systems and cultural narratives they encounter.

As has been implicitly intimated, consumers are not the only actors in the sites where VR is consumed. In the process of exploring sites of virtual consumption, it quickly becomes obvious that consumption involves not only space and spectacle, but also protocols of social interaction between consumers and those who work in, manage and own the sites. Where consumers meet staff and operators of venues, techno-culture meets economic practice. If spectacles are stories about where culture meets technology, the cultural narratives of these meetings are reworked and are employed in discourses of work, production and economic rationality. Those who own and work in such sites are not acting randomly, but rather organise their activities in accordance with norms, regulations and rationales which govern the economic and social worlds in that site.

The notions of industry, of work and skill, and of 'productive' economic activity in local sites therefore act as the organising principles of this chapter, just as they acted as organising principles in the sites of VR distribution and consumption I explored. How do sites/ spaces come to be organised the ways they are? Who are the social actors involved in putting together and organising such sites? What do they do, and how do they interact with each other? What is their interest in organising sites in specific ways? As Balsamo (1996: 128) asks, 'when virtual realities are bought and sold, who will profit?'

According to Clarke and Critcher (1985), the supremacy of business and commerce in the organisation of leisure can be attributed to the imperatives of capitalist economic exchange and accumulation, especially market identification and exploitation. Such a view of economic determinism in both leisure/ pleasure consumption industries, and in information/ communications technology industries, is echoed in the fantastic cyberpunk fiction which depicts dystopian capitalist futures. Here, both work and pleasure are subsumed to logics of corporate accumulation and monopoly.

Gibson's (1986) *Neuromancer* trilogy, as well as (1993a) *Virtual Light*, Neal Stephenson's (1993) *Snow Crash*, Pat Cadigan's (1991) *Synners*, Marge Piercy's (1992) *Body of Glass*, and other texts of the information age¹ are set in urban near futures where capitalist corporates replace/ become nation-states, suburban enclaves are franchised, and capitalist markets define all highly privatised digital and social exchanges. Such visions identify corporate capitalism's monopolistic tendencies (de Landa, 1996), foreshadow the ongoing expansion of such tendencies, but in doing so posit such accumulative and rationalised capitalist futures as inevitable (Gibson-Graham, 1996: 100). Such discourses tend to be supported by analytical approaches which posit the 'already inevitable' permutation of capital to the virtual on a large scale (Kroker, 1996).

Such broad brushstrokes, while providing a background framework with which to view the economic activity at virtual reality venues, do not address how the notion of 'capitalism' might be connected into local leisure businesses, and the everyday organisation of consumption spaces.² Arguing that the development of global 'virtual' capital is inevitable does not address how the social and cultural aspects of capitalism achieve uneven institutionalisation, via different forms, in a plurality of economic practices in different locales. Furthermore, such approaches do not address how businesses organise their economic activities at an everyday level, nor what particular social and cultural formations are utilised and instituted in different local sites: in other words, how economic activity is 'embedded' in the specific social relations of a locale (Granovetter, 1985).

The broader cultural dimensions of economic rhetoric and organisation do need to be recognised: without, however, falling into the trap of either economic or technological determinism. Alternatives are possible, and Gibson-Graham (1996) argues that one means to destabilise and displace economic rationalism is exactly by paying attention to the contradictions in multiple local sites of economic organisation and practice. In an attempt to construct/ utilise such an approach here, I turn briefly to the notion of 'culture industries', then examine the organisation of social and economic relations in sites where virtual reality technologies are consumed.

Consumption and Culture Industries

The new 'cultural dominant' ... is not *caused* by changes in technology and economic organisation, but is a constitutive part of the complex social transformation. Moreover, culture is not a homogeneous field whose content can be 'read off' from the economy, but a locus of struggle. There are contradictory currents in intellectual, artistic and popular norms and practices, and conflict over the means and relations of cultural production.

John Goss *Modernity and post-modernity in a retail landscape*

Technical objects are fundamentally integrated in systems of economic activity, exchange value, and capital development in western cultures, as has been noted by a wide range of social theorists (see, for example, Bijker and Law, 1992; Callon, 1991; MacKenzie and Wajcman, 1985). Positioning technical artefacts as commodities is a well established strategy linking culture, technics and value. One very good example of the process of constructing such connections is Rose's (1989) account of Apple Computers. According to Rose (1989: 38), at Apple, there was a general recognition that 'it wasn't just computers they were selling, it was a vision of society, a vision that was as liberating and utopian as it was wrapped up in the excitement of self ...' Just as technical objects such as virtual systems become meaning-making objects in consumption spectacles at particular sites, they also become economic objects in the *work* and *value* that is constructed at those sites. This work is that of the actors involved in 'culture industries'.

A range of different consumer pleasures are constructed in diverse sites according to different ways that 'culture industries' organise virtual reality technologies as simultaneously technical, cultural and economic systems. As I have argued in previous chapters, organising virtual systems relies on the conventions and organisation of already familiar social worlds for their impetus, as well as the institutionalisation of new sites, audiences and markets.

According to Hirsch (1972: 642, see also Becker, 1982: 122-129), the culture industry system is comprised of

all organizations engaged in the process of filtering new products and ideas as they flow from 'creative' personnel in the technical subsystem to the managerial, institutional and societal levels of organisation.

In my research, those who are part of the culture industries include those who are employed in various capacities by art galleries, arcades, bars and theme parks, the sale of home VR products or the administration of servers.

These roles are particularly prominent in location-based sites, and include work which is at the interface of spaces, technologies and consuming publics, such as staff attendants, or those who are contracted to work on or manage single projects requiring their particular skills. There is also work which is invisible to immediate observation, but nevertheless crucial in maintaining centres, such as bookkeeping, or the work of cleaning the technical apparatus (Star, 1991).

Those who *manage* and *own* such sites also have significant roles to play in running art galleries or leisure venues as *business* concerns, including financial, personnel and stock management, managing community relations (including local social communities, as well as business communities) and managing the planning process, as well as investing in the ongoing maintenance and development of the venture. Those who manage, own and work in the *manufacture* of virtual realities (as distinct from their distribution) are also key players in culture industries, and are the subjects of Chapters Seven and Eight.

Those in culture industries seek (variously) to rationalise social activities in virtual reality venues (to predict profit maximisation), and therefore seek to control the behaviours of other actors, particularly consumers in those sites, towards rational economic systems of exchange. The large potential audiences for cultural products are, however, uncertain. Connecting virtual reality technologies to audiences is an enterprise which consists of risk and its minimisation, hence industry orientations towards the 'mass' production of cultural goods and services (Traube, 1996: xv). In some sites, maximising short term profit is the goal — to receive a return for capital investment in as short a time as possible, to minimise capital risk. In other sites, cultural products are long term investments in which immediate profit is sacrificed to long term risk ventures.

On the one hand, this 'rationalisation' is the organisation of a set of social interactions towards economic goals. At the same time, such rationalisation is a discursive construct, overlaid on the messiness of economic activity in virtual reality sites: a discursive construction which also works to regulate the organisation of staff and management by subsuming the plurality of economic activity to the logic of 'Reason' (Gibson-Graham, 1996). In both cases, consumers must be encouraged to desire virtual 'experience' through the rational disciplines of the economic system at work.

Approaches to the analysis of cultural production and distribution have focussed variously on 'production theories'/ political economy/ critical

theory (see Crane, 1994), and 'consumption theories' (see, for example, Traube, 1996; Featherstone, 1995; Fiske, 1989). Still others have argued convincingly that 'culture industries' comprise networks which move across moments of 'production' and 'consumption'. As de Certeau (1984) has demonstrated, for example, 'production' and 'consumption' cannot properly be considered separate domains of social activity.

This is particularly the case with public venues for participation in virtual reality technologies. Those staff who 'produce' virtual realities as economic and cultural objects in consumption sites are often the most frequent 'consumers' of such experiences. As such, they acquire the skills and knowledge to guide initiates (the resonances here with ritualised forms of boundary crossing are unmistakable — see Tomas, 1991) into the realms of virtual reality. Such crossovers confound easy interpretation of 'production' and 'consumption', and the links confuse the boundaries of structure and agency which cut across them.

Throughout the discussion which follows I shall attempt to focus on these points of connection and crossover — the networks of action and interaction where management, staff and consumers meet and part in sites of virtual reality distribution. I am interested in how all these actors collectively construct virtual systems as economic objects, while simultaneously becoming subject to techno-economic discourses. The interaction amongst staff and crowds, and the ways they interact through the regulation of virtual reality participation, is a key component of these networks. What artefacts are teamed up together, around what kinds of spaces and activities, and through whose action, is one means of exploring how new technology entrepreneurs draw the customers in (or keep them out), and how they reach the widest possible audiences for virtual realities as cultural commodities.

Knowledge, Skill and Regulation

Scene:

She hitches the coat more tightly around her shoulders and ducks her head a little, a defensive measure against the impervious eyes of mall security. She knows, with all the inevitability of subway grime, that they will come and ask her with steely politeness to 'move on please, ma'am.' She is watching the pictures through the window, pictures on the screens of big men in white armoured suits, walking through green fields and through purple and grey streets and planes swooping down and other men fighting in blue and a red woman with a brown gun that looks like the drill that the men use on top of the street. Perhaps these people are from Iraq which is far away but you can see them if you look on television because they have bombs there. The television in the window looks like television but not like real people television. A young

woman was looking at her, not at the pretend television. Quick, turn away, but her eyes move back to watch the man on the machine. The man on the machine was standing still and they were putting things on his head, but it didn't look as if it was hurting him like the machines they put people in if they are sick. There are squiggles on the walls by the machine like the up and down, black on grey paper that has to go under the jacket in winter, and she knows that this is writing - but what does it mean? Does it tell you if the man is sick? Does it tell you to 'move on please, ma'am'? The flash of sombre blue in the corner of your eye will tell you that. Move off slowly, slowly ...³

If, as I argued in Chapter Five, images and spectacles mediate and regulate appropriate actions and identities for participants in sites of virtual reality consumption, the staff and management in the centres also have a role to play in regulating the consumption of virtual reality technologies: sometimes before potential participants even come through the door. The regulation of *access* is one means to regulate participation. The Digital Realities centre in San Francisco for example, a virtual reality themed leisure centre, has walls of glass. Before a potential customer even enters the store, the machines, television sets and goods items are on display to be viewed from the 'outside', a parade of consumable pleasures enticing in the customer (the Digital Realities storefront is similar to that of Virtual Worlds, shown in Fig. 6-1).

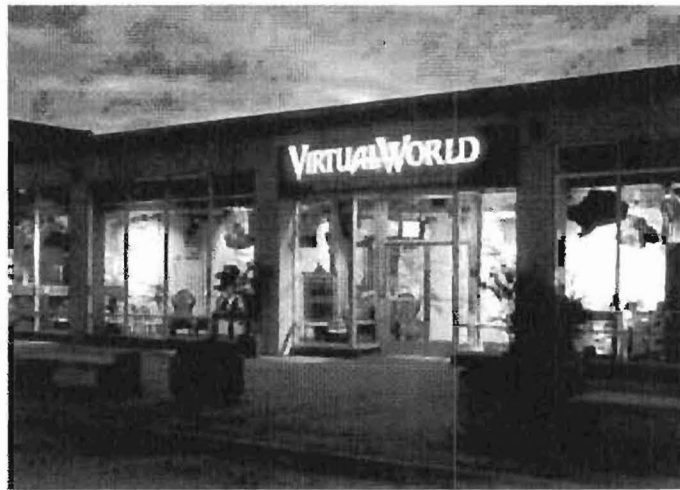


Fig. 6-1
Virtual World Storefront
Virtual Worlds Entertainment Ltd. Advertising
© Virtual Worlds Entertainment Ltd.

Some of the staff in Digital Realities commented that they frequently go outside the store into the mall to draw in customers who are standing and looking:

They just look, and they look completely terrified, and then I ask them to come in and check out the TV screens to see what they're doing. When they stand there and they look at that, they start to get interested (Kelly, Interview, San Francisco, March 1996).

Here, the staff actively invite in those they consider appropriate participants. Others who might be in the vicinity (the manager mentioned homeless people) are explicitly discouraged by security in the wider perimeter of the mall, and at least implicitly discouraged by the staff in a measure of boundary policing/ maintenance and 'cultural hygiene'. In some arcades I visited, certain people were excluded in specific times and places. Regulations are formulated by management at the centres (in the process of managing public and community relations) to exclude, for example, school aged children during school hours. In other cases, access to virtual realities is regulated via the relative accessibility of the spaces of consumption urban sites — in suburban malls, in downtown showrooms. Some have access more readily to these sites than others. In still other cases, access to the machines is regulated via a structured system of participation. The consumption of OSMOSE®, for example, is governed via telephone mediated appointment schedules. The management receive calls of interest to participate, and can consider these applications and organise a participation schedule before the work is even installed.

Organisations regulate access to virtual reality technologies in a number of different ways, but access is not the only way participation is regulated. The mediation of staff incites the desire to consume, and such a process simultaneously assumes and controls what bodies are appropriate in the sites, and what behaviours are tolerated. Television and text briefings are therefore heavily supplemented with staff involvement as 'attendants'. The staff at centres have become fundamental in ordering the behaviours of participants in and out of the worlds, and providing the interpersonal motivations to consume.

Once inside a venue such as Digital Realities, consumers are positioned *as* consumers via the forms of interaction available with staff in the venue. While they can view other consumers participating in virtual realities, their bodily, spoken interaction with people beyond their immediate interpersonal milieu is mainly with staff; the 'attendants' who help people in and out of the machines, explain and interpret digital worlds, instruct on behaviour, and make connections between images, sights, sounds and sensations. Contrary to approaches which argue that 'there is no interface to design' (Bricken, 1991),

virtual realities — as both instrumental objects and as cultural commodities — require significant learning, just as other forms of popular cultures require pedagogies which reproduce them (Giroux, 1994). Subjects must learn the machines, their parameters of use and the interactive pleasures they can provide — and are assisted in doing so through these pedagogies of the virtual. Staff in entertainment sites such as arcades are teachers of popular culture in this respect.

One manufacturing manager makes clear that staff are a financial investment in location-based entertainment centres which institute virtual reality technologies. The business invests in staff both to encourage people to learn about it for future markets (as below, ‘make sure that people know how to play the games and have a good time’), but also to monitor consumers’ behaviour quite directly.

I mean, it’s expensive, [VR is] expensive. It breaks down a lot. People get into them. They drop one of the headsets and that’s a five thousand dollar piece that’s suddenly destroyed. Because of that, because [site operators] don’t want to have to keep spending the money to keep fixing the machines, they have to spend more money on payroll, to have enough people there to make sure the things weren’t dropped, make sure the hood’s up correctly, make sure people know how to play the games, have a good time ... (Martin, Interview, Palo Alto, September 1996).

In arcades and themed leisure centres, learning to consume (to maximise the experience derived) thus coincides with the interests of venue ownership and management, whose aim is to maximise their return on their investment in the machines. The staff in such venues are crucial tools in this process. As a manager in a VR development firm notes, it is commercially important for both producers and operators to recognise that

[t]hey [the customers] don’t even know how to use this new interface — so you can’t have a great time until you’re comfortable with other navigational techniques or playing techniques, comfortable with the fact that you can work it out (Martin, Interview, Palo Alto, September 1996).

Interactions with staff organise the process of importing already existing skills with media and communications technologies (such as familiarity with other computing or information technologies, communications technologies, video games or even ATM or EFTPOS machines) to a new set of technical artefacts in a process of ‘transformation’. Staff verbally and physically cajole participants into acting in the machine, tell them what they should do, what they should look at, how they should be moving, and monitor their ongoing

activity in the machine. Sometimes participants are played a 'preplay' briefing video to assist in this process.⁴ Virtuality® have produced both 'preplay' and 'replay' stations which explain the concept of virtual reality, and 'demonstrate how to put on the VISETTE® visor and equip themselves for the Experience and clearly depicts what to expect from the game and how to play.' ('Preplay' and 'Replay' Stations are depicted in Fig. 6-2).

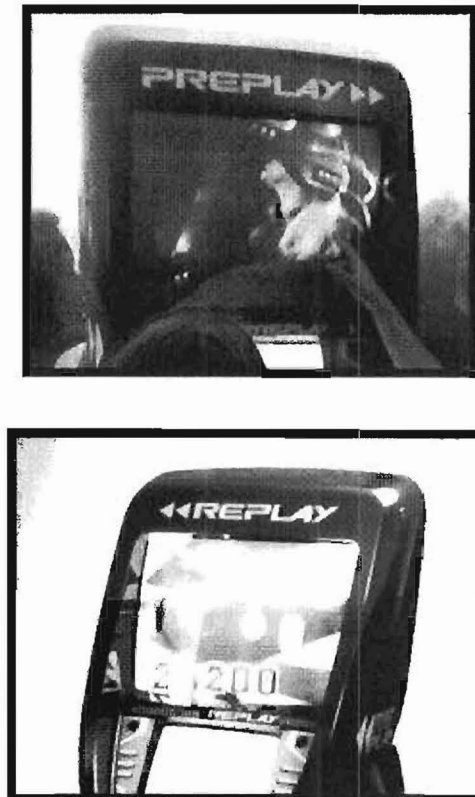


Fig. 6-2
'Preplay' and 'Replay' Stations
Virtuality (1993) p. 15
© Virtuality® Ltd.

The replay station is 'specially designed to provide highlights and action replay sequences ... [which] provides the group with the opportunity to avidly recount their game whilst watching edited highlights and encourages them to throw down the gauntlet for a repeat play challenge ... best of three ... best of five ...' (Virtuality, 1993: 16). At times, staff even interpret the characters and stories for participants both before and during the sessions, telling them who they are, what they're doing in that world, and why they are there.

Such cultural articulations draw together the work of institutionalising a new technology, and embedding that technology in particular economic systems. Two staff members in one themed centre described their work as attendants in this way:

I explain what people are doing (to potential participants), what they're going through and I tell them all about the game and all about what they actually would be experiencing and what they would physically have to do to do the game, what's going to happen to them physically. I also put them into the machines, make sure that they do everything correctly so that they don't damage the machine or themselves ... (Kelly, Interview, San Francisco, March 1996).

I ask 'are you fully immersed in the game? You're actually creating everything you're doing in it.' But I think if you lead them in there and they don't really know what they're doing, are not really sure what is happening, you have more of a tendency to be scared and disoriented, which won't make it fun at all ... You want to get out and it just won't be as fun as if you had somebody there (Christina, Interview, San Francisco, March 1996).

The staff are often aware that the knowledge that they have constitutes 'power' in this context, and that they are not only explicitly teaching people how to use the game, but also that participants' bodies need to be directed and physically disciplined to learn the rules of its consumption:

You're the one that actually holds all the knowledge and you have to let them know what's happening ... Sometimes we'll just have to take their gun and lead them the right way, or tell them how to push their thumb down ... (Kelly, Interview, San Francisco, March 1996).

The expectations that the operators and the staff have at retail leisure centres as to what constitutes a pleasurable virtual experience is formed by their prior knowledge, although each group's knowledge is constituted in different ways.

On the one hand, staff in centres are consumers, perhaps some of the most knowledgeable consumers of VR as they play while at work (*as work*), as well as outside work hours. They are those with 'habitus' in this world, and this habitual knowledge is the resource used by those who employ them. The technical disciplines of the machines, which can be constraining for consumers in their pursuit of leisure, can become if not a freedom, at least a temporary release from the strictures of other bodily labours in the context of paid work. It also contributes to a skills and knowledge base that is highly specialised, if not widely marketable. Some attendants and technicians in centres become collaborators in the form of the machine when the technical

support systems of manufacturers are not there or not effective. Attendants can fix or adjust the machines in the course of their work, sometimes changing those machines in the process. Here, VR enables 'real life' skills:

Eventually ... we got really good at figuring out cheaper ways to fix the things. You know, instead of having to buy a whole new unit... just put a piece of tin foil over here or wrap some tape round there ... I got pretty good at just being able to find the right space (Ben, Interview, San Francisco, March 1996).

On the other hand, owner/ operator expectations of pleasurable experiences for consumers are informed by the promotional materials provided by the producers of the technologies (even as they also rely on the knowledge of experienced staff). In the process of visiting arcades and theme centres, I encountered a range of promotional materials, the most comprehensive of which were magazine style promotions, and videotapes aimed at audiences in leisure trade shows and leisure industry conferences (such as I.A.A.P.A., the International Association of Amusement Parks and Attractions).

Virtuality®, for example, produced a magazine called *Without Walls* (1993), aimed at the promotion of Virtuality® products to location-based entertainment centres. With a foreword by the managing director and CEO, the magazine includes introductions to Virtuality® hardware and software in public commercial operations (see Fig. 6-3). Alongside numerous photographs of patrons using the systems in entertainment centres, the descriptions clearly emphasise Virtuality® systems as profit generators. In one segment of the magazine, Virtuality® detail a business plan for the operators of leisure centres which outlines strategies to maximise consumption:

The VIRTUALITY® Entertainment Centre offers a versatile, high profit potential on an on-going basis making it an extremely attractive proposition for those individuals or organisations seeking new and exciting business opportunities in the leisure industry... With VIRTUALITY®, system reprogramability provides maximum potential for return on investment... Revenues: Membership Fees: Should the Centre be operated as a club, these may be collected from members who form the core of the regular clientele. Usage Charges: Non-members may be allowed to use the Centre, however there may be a higher charge per play than for members. Retail Sales: Sales of merchandise and other associated items such as gift vouchers, stickers and badges. Catering: Depends on the total covers available. Ancillary services: Revenue generated from other video games if installed (Virtuality, 1993: 25).

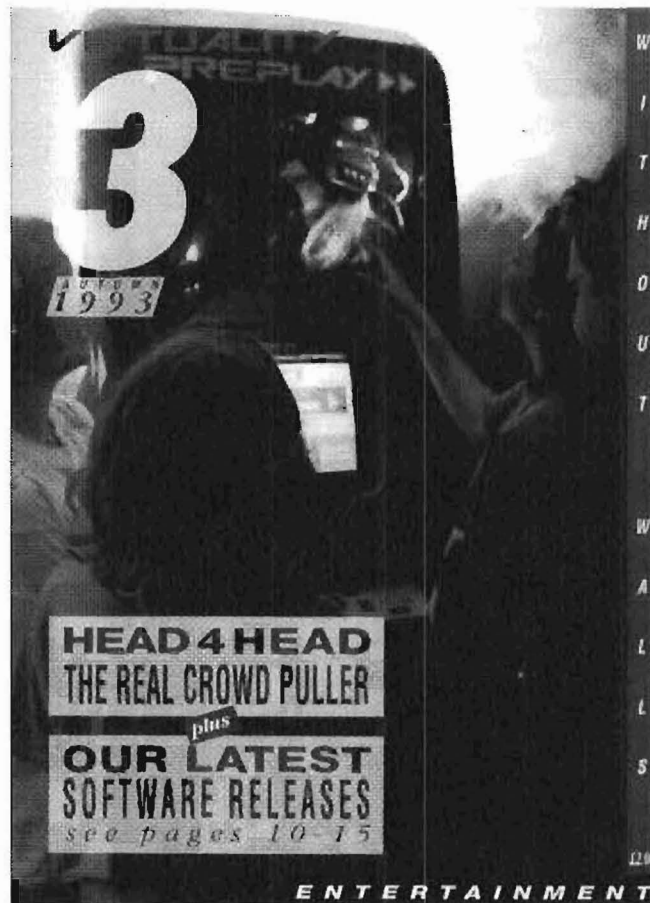


Fig. 6-3
 Virtuality (1993) Cover
 © Virtuality® Ltd.

The extent to which these arrangements achieve the effect of 'fun' is witnessed by the images provided of patrons in the centres. Throughout the magazine, images are provided of participants who are watching others, who are watching game play on monitors, who are clustered in crowds. Those who are connected to the machines are portrayed actively, their heads swiveling, their arms out, gripping the handset and turning, pointing, their mouths open, or with their arms up in signals of victory. All of them are either concentrating, or smiling (Virtuality, 1993: *passim*) (see Figs. 4-8 and 4-9, and 5-2 and 5-3, in Chapters Four and Five respectively). This sense of activity and movement is reinforced in promotional video images. As a young woman leaps and turns within a Virtuality® pod, a voiceover claims that

[t]he new Virtuality series 2000 machines, with their incredible power, 360 degree interactive game play, and unequalled price performance delivery, are set to revolutionise the location-based entertainment industry. Compelling game play, and stunningly realistic 3-D texture-mapped graphics combined

with 32-bit digital sound and the latest hardware design, leads to the unbelievable world of *Virtuality* (*Virtuality*, 1994).

The video begins with the words 'Once Upon A Time' emblazoned across the screen, and presents images of film reels turning. As the voiceover continues, the young woman in the pod engages in almost frenzied large body movement to indicate her 'interactivity'. These shots are interspersed with images of a television being dropped, images from *Virtuality*®'s digital worlds, and a man walking into and banging his head against the screen of a video game (to reinforce the fact that with *Virtuality*®, by contrast, you are 'invited inside').

Through these materials, operators (and potentially their staff) understand appropriate bodily behaviours for a satisfying consumption experience, and therefore attempt to reproduce/ reinscribe those behaviours on the bodies of participants in centres (especially as each consumer acts as an advertisement for others). In this way, appropriate actions and responses in participants become standardised in the repertoire of operator and staff understanding of pleasurable bodily activity. Sometimes extreme measures must be taken to get consumers to behave appropriately:

I've seen some people who work here just go up and grab a person, and turn them around ... because they're just standing there staring out into space and not doing anything and because they're frustrated at yelling at them and they don't hear it. And they freak out because all of a sudden there's this hand holding them that [isn't] there, that they can't see (Christina, Interview, San Francisco, March 1996).

'Not doing anything' is not an appropriate behaviour in a medium that is supposed to be 'interactive'.

The staff see themselves as integral to the process of producing 'fun' for consumers, which entails educating them to the requirements and disciplines of the machine system. Staff aim to ensure that participants' physical and cognitive experiences both in the 'game', and in the site, are such that pleasure will result.

In commercial or retail centres, to sell is the top priority. There are people who consume enthusiastically many times over. But not everyone 'buys' — and not everyone who buys an experience 'buys' any particular ideology about 'the virtual'.⁵ Marketing is therefore at the heart of VR as much as any other commodity based cultural elaboration. The staff seemed to take this on (and if they were to continue in employment, they had to):

Basically my job is ... I sell the games ... I sell people into wanting to play the games and I teach them what the games are ... trying to make them sound as attractive as possible, or as least fearsome as possible (Kelly, Interview, March 1996).

Another attendant, Christina, is more resistant to being cast as a salesperson or marketeer:

I don't like the idea of pushing it. [I like] talking about it, letting people be informed on what it is ... (Christina, Interview, San Francisco, March 1996).

According to one centre manager,

I trained my staff to sell better because to stay in business, just to pay the salaries of the people I had in the centre, I had to force each of them to sell at least three times what they were being paid that day, in merchandise or in games. So I laid out an infrastructure to reward them for better sales and teach them how to sell. One of the other goals besides making sure they were dressed right, is to make them into sales people ... Top priority was to turn these guys from attendants, which is what they were called before, into a sales team (Ben, Interview, San Francisco, March 1996).

This is an important point in retail VR. The issue of attendants is fraught in the economic model within which the centres work. The staff are disciplined as subjects of the 'return on investment' model of business organisation. The 'return on investment' model suggests that staff be familiar with operational procedures for technical equipment. These practices not only conform with standards of health and safety (for example in first aid and emergency procedures), but coincidentally mean that attendants are effective at getting people in and out of the system at a rapid rate, and efficient in their confident use of the machine.

This contradictory position gives rise to ambiguous relationships with the other participants in the scene. On the one hand, staff are consumers, and as consumers they are as critical and self reflexive about the 'experiences' on offer as other consumers. On the other hand, staff collaborate with management in producing particular kinds of experiences for their audiences. Staff are expected to sell the games to customers (by developing knowledge about the systems), and act as an advertisement for the games through their bodily presence (both inside and outside the machine). Their employment requires them to physically maintain both themselves and the machines as elements of the spectacle, and maintain the 'standards' the themes set in centres.

These expectations of their tasks mean they are regulated through their work practices as staff in service industries. One common form of regulation found across professions, staff appearance, is considered particularly important in theme centres where selling is important. One manager describes how the owners of a themed centre concentrated on the appearance of staff:

When I first started, [the] priority was to make sure everybody was dressed correctly. He apparently had never got anyone to dress the way he wanted them to ... told me to go on in and if I needed to fire everyone, to hire people who knew how to dress properly, to do that. And I assured him, I could probably figure out a way to get people to dress correctly without having to fire them all ... (Ben, Interview, San Francisco, March 1996).

In addition to the appearance disciplines of sales and marketing occupations, there are the specific service and emotional tasks circumscribed by their job descriptions and centre management. The descriptions of jobs for attendants are those of service workers in a number of similar professions. Service work requires the discipline of appearance and of appropriate interactional skills which include emotional labour (Hochschild, 1983). There are also physical labours specific to virtual reality technologies.

For example, the 'Manual of Safe Operation' (see Fig. 6-4) for Virtuality® machines (Turner, 1993: 25) outlines sanitation procedures to reduce the risk of 'cross infection':

The Visette™ is designed for multi-user operation and for this reason should be kept visually clean as described in the equipment cleaning procedures included in this manual. If any user, for personal hygiene reasons requests that the Visette™ be cleaned, this should be carried out immediately with the provided medical wipes.

I have never seen such a concentration of blue and white plastic towelette wipe packets as I did in virtual reality centres. In such ways, the highly gendered (and often privatised and invisibilised) work practices associated with cleaning are shifted into the public sphere as work for attendants. In this context, the visibility of the towelettes both acts as an advertisement for the careful hygiene practices of the store, and the cleaning work takes on the valence of ritualised sanitation as the intrusion of the 'natural'. This 'natural', associated with the privatised and feminine, is in the form of skin, of hair, of human parasites and bacteria, and is policed and prevented from taking hold in the technical realm. The workings of the body are implicitly acknowledged

in the presence of the towelettes, but its effects are simultaneously denied in the eradication of its traces.

VIRTUALITY™ 1000CS

MANUAL OF SAFE OPERATION

Written by John P Turner
© Virtual Reality Support Systems 1993

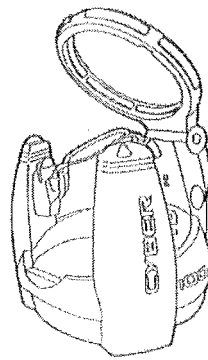


Fig. 6-4
Virtuality® Manual of Safe Operation
Turner (1993) Cover
© Virtuality®

As is the case in many service industries, the physical and emotional work of selling and attending is undervalued, and staff job security in arcades and themed centres is fragile.⁶ The economic model through which such local operations are run means that staff are high overheads, and their cost adds directly to the capital cost of the machine and its maintenance. The issue of having staff at all is therefore fraught, and operators play a trade-off game between the costs of staff and the costs of equipment damage.⁷ Sometimes the staff can do their job too well. Because location-based virtual systems are simple to operate and often automated, it is possible for consumers to get so good that all they need to do is obtain the appropriate game disk. If they know how to use the equipment, and payment is automated, then staff are no longer needed — which operates in the favour of centre operators. In one virtual reality themed bar/ café that I went to in Berlin, I watched as one young man played game after game, on three different machines, swapping from one to the other, without any assistance from any of the attendants. His

payments were taken off a magnetic strip card, and he was familiar with the equipment, and so could engross himself in the process of interacting with the machine systems, as well as consuming the game. For consumers, this is the process of becoming *self*-regulating and *self*-disciplining virtual subjects. For staff, it represents a potential challenge to their employment.

If a mass audience for virtual realities are encouraged to learn how to use the machines themselves (with the appropriate respect for the equipment), then it progressively cuts down on the cost of attendants for the centre. It also, of course, encourages the formation of a consuming public who is familiar with the concept and the technical artefacts, and who will continue to consume: it becomes embedded in ongoing leisure activities, and provides further potential markets in home use.

This point is as valid in the consumption of virtual worlds at sites other than arcades: it is also the case in 'edutainment', gallery and industry conference contexts. In all of these sites, the construction of a knowledgeable audience of consumers is an element of the process of participating the worlds generated by virtual systems. Even if that participation is vicarious, understanding and interpretation of, and familiarity with, virtual reality technologies is still learned. The organisation of different sites of consumption work towards different goals, however. Not all the means of consuming virtual worlds necessitate attendants in the same way as arcade and theme parks do. In ways of organising the economic exchange alternative to the 'return on investment' model, the emphasis is less on marketing to the volume of consumption, and more on marketing to the form or quality of it.

It is also the case that the attendants required for different systems vary both in number, and in skill levels. Those worlds produced by garage VR hobbyists, for example, are often presented at computer trade shows such as SIGGRAPH (see Chapter Seven for an expanded discussion of this conference and its role in the VR industry). One 'garage' VR builder, Doug Faxon, showed a world he had built at SIGGRAPH, an industry graphics conference. He describes his role in this way:

I learned a little about people and virtual experiences, virtual interfaces demo-ing that thing for three days straight, you know, standing there in my suit ... helping person after person get on and off this thing ... telling him [sic] how to make it work in thirty words or less. So we learned a few things about what people will put up with. Murphy's law of interfaces — they're not going to work like you want them to work (Doug Faxon, Interview, Santa Rosa, September 1996).

In this case, the technologist who built the technology was the attendant for it. This is similarly the case with OSMOSE© and Placeholder. In a gallery space, where the focus is aesthetic appreciation and education, learning the parameters of a virtual world (positioned in contrast to arcade worlds) creates future audiences for such installation works. In the construction of a virtual world as a gallery installation, gallery staff are appointed to various tasks in this exhibition as they would be for any other gallery show. Thus, much of the work in the sites is the same as it would be were virtual systems not on site. Constructing the installation space is an important component of physical labour in the gallery context, and is often carried out in conjunction with the artists. The work of constructing Placeholder's space is illustrate in Fig. 6-5. Gallery work of different capacities also includes such mundane tasks as ushering audiences through spaces in the appropriate direction, explaining and interpreting the work, answering questions, or giving directions to the toilets (for an extended discussion of the division of labour in art worlds see Becker, 1982).

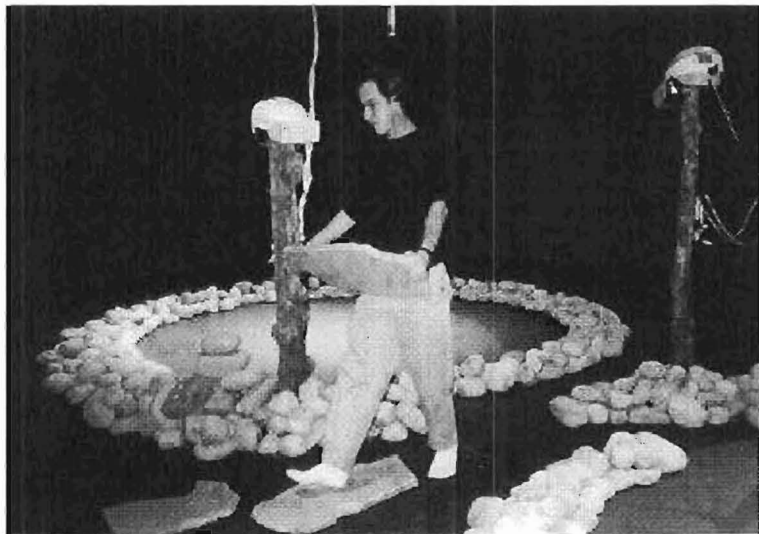


Fig. 6-5
Placeholder Installation Space
[http://www.interval.com/
projects/placholder](http://www.interval.com/projects/placholder)
© Interval Research Corporation

The expertise required to get people in and out of the OSMOSE© bio-apparatus system, and to operate the equipment, is provided not by the staff in the site of distribution, but by personnel associated with the artistic team which produced the work. As is made clear on the Placholder website

([http:// www. interval. com/ projects/ placeholder/](http://www.interval.com/projects/placeholder/)), showing Placeholder is a complex process, requiring eight people to perform simultaneously:

Someone to play the Voice of the Goddess in the booth above the performance space, and someone to sit by the Goddess to relay messages to and from the rest of the support staff – which included a floor manager and two assistants to help with participants “suiting up”, two people in the windowless SGI room, and a person controlling the sound processing computers. The support staff had a lot to do behind the scenes – creating new Voiceholders at the command of the Goddess; much of the software was buggy and had to be rebooted on the fly – if the memory leak on the SGI Reality Engine’s texture memory got beyond four megabytes the frame rate would suddenly drop below tolerable limits and the whole system would have to be rebooted ...The performances were exhausting, coming on top of the grueling development and hacking ...

The attendants in Placeholder who run the experience are therefore relative experts, and are running extremely complex pieces of equipment, far more complex than those at leisure centres. The expense of that equipment serves to make them careful about which bodies are connected as participants, and how, into the parameters of the machine.

Some of the work attendants do in OSMOSE© is much the same as those who work in centres, although they are processing far fewer bodies through the immersion apparatus, and have a slightly more complex job in terms of adjusting equipment like the breathing harness. A further difference in OSMOSE© is that in contrast to the work of centre attendants, the work is conducted in private, behind ‘aestheticising’ screens, and so is not subject to the gaze of other consumers in the way staff in centres are. It is only when the world begins that the body of the participant becomes a spectacle for the gaze of others.

The attendance work in OSMOSE© and Placeholder which immersants and audiences experience is supplemented with video texts on the experience. This is documentation which, while it does not play for the immersant or audience at the time of the performance, provides detailed instructions for how the apparatus works and how to get into it — very similar to the ‘preplays’ of Virtuality®. The documentation on the installation also give instructions on what the experience is supposed to look and feel like: an experience of the technical is translated into an experience of the aesthetic. The video documentary details how participants are assisted in and out of the apparatus, and how they are instructed before their ‘voyage’.

The spectacles in both OSMOSE© and Placeholder are highly aestheticised and iconic. In Placeholder, attendants carry out the same activities of getting

bodies in and out of equipment, and run the computers that produce the experience. It is also possible though, for these attendants to intervene in the *virtual* world while it is being played, via digital means. Placeholder instructions are given from one of the artists, Brenda Laurel, who is watching the process of participation in physical space, while also having access to the participant's point of view (as does the non-immersed audience). A 'goddess' character is scripted into the scenario of Placeholder's digital worlds, appearing as a voice who can regulate action in the virtual worlds by suggesting alternatives to present action (rather than intervening in bodily ways as the attendants in leisure centres are forced to do in the case of 'inappropriate' behaviour). Brenda Laurel, taking the part of the 'Voice of the Goddess', is portrayed in Fig. 6-6.



Fig. 6-6
Voice of the Goddess
[http:// www.interval.com/
projects/ placeholder](http://www.interval.com/projects/placeholder)
© Interval Research Corporation

The economic model prioritised in gallery installation doesn't come to (economic or cultural) crisis over issues such as staffing, because permanent and expert staff are required by the gallery in an ongoing way no matter whether virtual systems are situated there in the short term or not, and because special projects require their own expert staff. The gallery does, however, place a long term investment in consumers learning virtual reality technologies (especially if the gallery is to show such work again), and to sponsor artists who are producing this genre of work. If audiences for virtual worlds consumption are cultivated, they can also be alerted to other related

work which the gallery supports, and thus create long-term patrons. Expert consumers are particularly important in this respect, computer professionals (see Davies, 1995a), who can see the benefits of alternative ways of creating virtual systems — transforming the parameters and/ or transfiguring the cultural potentials of VR. OSMOSE© is more successful professionally and culturally than it ever would be economically (if one is assessing the costs and benefits along the lines of a ‘return on investment’ economic and organisational model).

The interests of consumers, staff and operators come together in sites of virtual reality consumption, and the worlds of each in interaction with the others serve to regulate bodies in sites of virtual reality participation. On the one hand, staff are important resources for management in location-based consumption because they act through interpersonal relations both to incite the desire to consume, and to pass on skills and knowledge about how to consume. In doing so, they institute a particular form of consumption which is designed to maximise (both economic and cultural) profit for the location at which they work. As staff members in these places, they have the opportunity to participate as consumers (because it often creates free ‘advertising’ for virtual experiences in spectacular spaces). Whereas ‘naïve’ consumers are disciplined by this consumption, it offers staff freedoms of various sorts from the disciplines of attendance and selling work. On the other hand, staff are also heavily regulated as service workers in leisure industries. It is these industries, and a fuller consideration of the role of owners and operational economic and organisational models, that are addressed in the final components of this chapter.

Operators and Brokerage

Scene:

A boardroom in a corporate building. Two opaque walls, at the smaller ends of the rectangular room, sport framed prints. One of the other longer walls is made of glass, and faces back towards the reception area. Heavy double swing doors with giant metal handles are embedded in the middle of the glass plates. The fourth wall also consists of glass, but forms the outer wall of the building. Mirrored when approaching it from the outside, from the inside the wall forms a breathtaking view out over the sea to the island. He sits opposite, at the narrow end of the oval table of polished wood. He has just sat down again after ejecting the video of the 15 minute computer graphics animation featuring a vehicle point of view for a motion platform ride. ‘Now that,’ he says, ‘is where it’s at.’ He takes another drag on his cigarette and blows the smoke out sideways. ‘All the stuff with the headsets and crap, people don’t want to do that. Too messy, whole lot of other people have been in it.’ He pulls a face. ‘People don’t want to do that’ (Fieldnotes, Auckland, January 1995).

VR operator and distributor organisations like the one described above bring cultural, economic and social organisation together in the institutionalised distribution of virtual systems as commodities for consumption. As such, they are ‘cultural intermediaries’ (Bourdieu, 1979; see also, Lovatt and Purkis, 1996). Both the staff, and the managers and owners of centres, are ‘cultural intermediaries’ in different ways. Cultural intermediaries can both *translate* and *broker* in the process of framing consumption. They *translate* virtual systems from technical into economic and cultural objects, and *broker* those virtual systems that finally reach a consuming public from their manufacturers.

Sites of virtual reality distribution can be organised in any number of ways, and I encountered a range of organisational networks during my research. Virtual worlds positioned as art are often found in gallery or museum contexts (although they can also be installed at ‘trade’ shows, as in the case of *Detour: Brain Deconstruction Ahead*).⁸ Galleries are often funded by city or state government (although this varies with the country), but also rely heavily, especially in the North American context, on private funding from art patronage. Arcades and theme parks are generally organised around private capital investment, but this can be arranged in a variety of ways (see Chapter Seven). Companies which already have other investments in leisure and entertainment industries, for example, can buy VR systems to add to already existing venues. Alternatively, a themed site can be opened as a limited project or ‘one-off’ venture. Some companies set themselves up as franchise operators specialising in themed VR centres. In contrast to a franchise systems, other companies own and operate a chain of venues themselves.

These cultural ‘brokers’ intervene in the construction of culture through their understandings and positionings of virtual systems as economic objects. Virtual systems as cultural texts acquire economic exchange value through the context of their commodified location as an ‘experience’ among others in entertainment markets. It also acquires material value through the positioning of the technical artefact in markets of production, distribution and consumption. The digital experiences available to a consuming public are initially produced through the impulses of capital accumulation and profit motives (Brook and Boal, 1995). The whole point of making digital experiences available to a consuming public is to gain some profit through

their consumption. One manager of a themed franchise venue, for example, described his job in the following way:

My goal was to make sure that everybody who walked into the centre left after spending some money ... with the best time they'd ever had in any centre. I would do whatever I could to make sure that they would leave thinking [the store] is cool.

The goal was a fifteen percent return rate. They were catering to tourists and to people who just wanted to come in and sample what virtual reality was like and then never come back. And I guess that's OK, but my experience with customer service has been the opposite. The goal is to make sure people come back again, and again and again (Ben, Interview, San Francisco, March 1996).

As Ben indicates here, the premise of accumulation generates a number of strategies to secure audiences, and the combination of economic and cultural strategies operates unevenly amongst sites. One marketing manager in a manufacturing organisation described their attempts to experiment with combinations of these strategies:

Now we know there's a limit to how much people will pay. So therefore we work back from there. We're finding at the moment we're getting away with four to five dollar plays. We've just recently done an experiment where we had two dollar plays and we had twice as many people going through it. Then you're down to the restriction, the physical restriction of the equipment. Getting in it, putting the head mount on as well, taking the head mount display off, it all takes away from the game play time (Martin, Interview, Palo Alto, September 1996).

The combination of consumption techniques that are employed differ across sites depending on the economic model that is a point of reference. Some cultural products such as Virtuality® systems are more mass produced than other systems (see Chapter Seven), and their distribution is organised around a return on investment economic model which maximises short term consumer turnaround. As in other entertainment and leisure industries, 'successful' consumer pleasures are those products which maximise 'throughput', change rapidly and flexibly to encourage repeat business based on novelty, but which also maximise familiarity; they draw on a number of social worlds and technologies (the conventions and formulae of culture industries). In arcades, bars and cafés, a mass audience is both assumed and generated, but is unstable.

By way of contrast, in leisure and entertainment industries, such as the distribution systems surrounding art worlds, long term consumption and the values and knowledges associated with 'high' culture are foregrounded (see

Bourdieu, 1993). The distribution systems and sites associated with works such as OSMOSE© operate to secure audiences for an ‘art work’. As Barry (1996: 151) notes,

[d]istribution and access can also be found through installation and exhibition. However, the development of sponsorship and funding for the mounting and organising of electronic and digital work is at the moment several magnitudes higher than an exhibition based on a traditional medium ... The logistics of locating and organising the expensive equipment required means that specialised agencies are developing to meet these needs. Although these organisations are often heavily subsidised, alleviating the actual economic costs, another layer is placed between the creator of the digital work and their ability to locate a path of distribution to a wider audience.

OSMOSE© is a ‘one off’ work, as is Placeholder and Detour: Brain Deconstructon Ahead. As such, their cultural value lies in their singularity and authenticity (their ‘value’ as far as consumption practices go), and are thus worked through an alternative economic model of patronage and long term investment in attracting/ encouraging gallery audiences.⁹ Although the artists, Char Davies, is not adverse to exhibiting the work in other forums, she is extremely selective about the context of spaces in which the work is shown, and is careful to select venues at which there is sufficient time to both install and exhibit OSMOSE©. While the potential audiences for the work are wide, Davies is concerned to protect the works ‘integrity’:

Have been approached by entertainment venues but am careful to look for venues that will respect the work’s integrity, not just offer it as a gee-whiz crowd-getter. Museums are better than a DisneyWorld type situation. Also because immersion is solitary ie one person at a time, the ‘through-put’ is very low - therefore it is unsuitable for places that move huge crowds (Personal Communication, 1996).

Long term investment assumes that returns come in forms other than immediate cash returns. Investments made in the cultural elaboration of technologies are an investment in growing long term audiences — individuals who have learnt the cultural potentials of virtual realities, and will therefore consume if not this product, then similar products in the future. In addition, they have other technically oriented values (research and development, the application of techniques in other works and products, intellectual and product oriented patents and copyrights), which also contribute to the operational exchange practices I am attempting to identify here (see Chapter Seven).

In both economic models, however, there is a high level of uncertainty and risk in economic investment on the part of cultural intermediaries (Lewis, 1986), especially in the case of a product like virtual reality systems where the 'product' as such is still emerging (and which can be cast as a number of products). As Traube (1996: xv) notes,

fragmentation of the cultural marketplace heightens the uncertainty endemic to the culture industries about "what the audience wants". Against an industry convention that the "mass audience" craves the familiar and will only tolerate innovation with certain (negotiated) limits, fragmented audiences can plausibly be portrayed as especially receptive to aesthetic experimentation and/ or alternative cultural values ... the particular images of the audience elaborated by producers are a force in shaping what will become available for consumption.

This fundamental tension produces sometimes contradictory activities on the part of operators. Sometimes, they promote a single, expensive system/ world as a project of cultural exploration, or invest heavily in a wide range of virtual systems to the exclusion of other products. At other times, they act conservatively for a 'mass' audience and embed the systems amongst other digital products, which minimises risk in a return on investment model.

It is tempting to attribute considerable cultural power to the operators of centres, as they own the decision-making processes of what products will be displayed in centres and galleries. However, the short term return on investment model presents problems and conflict in the relationships between consumers, operators and producers of VR systems. Owners and managers too hold contradictory positions in relation to other groups because their consumption is of a different sort to that of participants. This is because there are two different *kinds* of consumption happening: the consumption of objects on the part of operators, and the consumption of media and worlds on the part of participants (Ang, 1992).

The economic demands of small or even medium sized businesses and franchising operations, for example, prompt both collaboration and divergence in the interests of manufacturers and location-based operators/ distributors. On the one hand, distributors collaborate with VR production companies through a number of mechanisms (in their decision making processes to buy or not, in explicit feedback about their requirements to companies) which affect both the form of the machine and the ways they are constructed into economic and cultural objects at the sites of their use.

On the other hand, distributors *are* consumers, although they are a different kind of consumer from the participants who consume virtual experiences. Operators/ distributors are instead the direct consumers of technical objects/ products, of the technological *artefacts*, as well as the experiences as products. As such, they enter directly into networks of negotiation with the individuals and organisations that create technical products. Their opportunities to position themselves as ‘cultural intermediaries’ is therefore constrained by the forms of technologies they are offered by manufacturing companies (see Chapters Seven and Eight).

Operators/ distributors produce the cultural space of their centre, but they are also subject to the marketing presented to them by those firms that produce the systems. They reflexively make evaluations about those products on the basis of their major interest in the product — primarily as an economic investment, but also as a cultural product which encourages a return on that investment in the later instance. Martin, a marketing manager of a virtual reality production company, is aware of the contradictions facing distributors, and how that affects their consumer relation with VR manufacturing companies:

So if you put a VR machine beside a typical arcade machine, it'll probably take twice as long on the VR machine as it would do on the arcade machine. You're dramatically extending the period which it takes you to pay for the machine. It's not good from the operator's point of view. And on top of that you're paying twice the price (Martin, Interview, Palo Alto, September 1996).

At other times, it is less important for some groups to translate the VR system from a technical to an economic or cultural product, as they are more interested in the effects of machines as social products — a means to confirm social and interpersonal ties. One manager of a retail store talked about the problems he encountered with those who owned the franchise of the store he managed:

It started in 1992, I think, when a whole bunch of real young rich guys, right out of their fraternities ... probably weren't computer-oriented, were just getting rich-quick oriented. And they took all of their money, pooled it together and tried to open up a virtual reality centre. But a couple of weeks after the opening, a lot of the kids were still acting like College students. They weren't treating it like a business — they were giving games for free, or giving the T-shirts away to everybody. Just not getting it (Ben, Interview, San Francisco, March 1996).

The disjunctures between the cultural signs, images and stories of what virtual realities do, and the processes of incorporating them into public sites and economic strategies, are therefore spaces for negotiation on the part of site operators.

The rhetoric of 'alternative worlds' runs in the face of the physical practicalities of distributing, maintaining and supporting virtual systems. According to Martin, a manager in a manufacturing firm,

anything that's public is going to get ransacked. Most of our operators will have engineers on site and we have good customer service, good spares, and if somebody's got a problem, we can send them a new head-mounted display, if the tracker ball has gone, the board has gone — it just gets swapped out. It's fairly modular. Like any other industry, we're geared up to be able to supply the parts that go wrong with little down time (Martin, Interview, Palo Alto, September 1996).

Producer organisations maintain that their support and service is part of the economic network they maintain to stay in business. At times, operators place too much faith in the ideologies which claim cultural and social power for an underdeveloped technical system. Operators talk about the lack of technical support, particularly in places other than the United States and Europe. The networks of support are firmly at the 'centre', and almost absent at the 'margins'. Operators claim that there is often no support literature or replacement equipment or parts, and little response from manufacturers. One theme park I visited in Auckland, New Zealand, has had VR machines sitting idle for fully two years, even after 'hacked' repairs by a resident technician. One operator went so far as to call the equipment a 'dinosaur' in disgust at the lack of technical or social support.¹⁰

At the same time, it is still in the interests of the operator to collaborate with producers around VR as a commodity. Because operators are consumers of manufactured goods, they provide a potential ongoing market for VR production firms, and those production firms may see potential gain from collaboration.

Slowly but surely the store started to fold. Finding money to keep the centres open until they made a profit was getting harder and harder, and they would find people within the industry to give them a lot of money just to keep alive so that would have a venue to use their machines. I would imagine we had at least a half dozen people on the Board of Directors who bought their seat in order to keep Digital Realities afloat. It was all people who manufactured the equipment or their software and just wanted to make sure there was a stable place that they could put their stuff, once they invented it (Ben, Interview, San Francisco, March 1996).

Similarly, sites like art galleries or 'edutainment' centres are sites of collaboration between distributors and cultural producers. In situations such as those of art or education, which use long-term economic strategies, it is in the long term interests of both creators and distributors to create an ongoing consuming public. According to Beryl Graham (1996: 173-175),

Assuming that the petulant technology can be cured, there still seems to be a need to rethink the exhibition form for interactive art, and examine carefully its audience dynamics ... any analysis of how interactive art is looked at relates interestingly to an eternal problem for art in general – do the images visually communicate what it is that is expected of the audience? ... Indeed, perhaps some varieties of the artform might change the gallery in ways that are highly ambivalent ... some answers to the difficulties of audience relationships may in fact be found in closer attention to the experience of municipal galleries ... And for the participant, too, the interactive installation is hard work. To be meaningfully experienced, it demands time and serious attention.

In the construction of long-term, knowledgeable and competent consumers then, 'high' and 'popular' sites of cultural distribution meet in their desire to construct long-term audiences. One attendant at a retail space phrased the point in this way...

I think this whole gaming attraction is trying to make the technology appealing to everybody. I'm sure there's millions of things that are used, advanced technology, but this is advanced technology that is made available to a lot of people — and it's making it attractive. With technology anyway, the more widely known it is the more available it is, the cheaper it becomes in the future ... Right now, home VR goes up to nine hundred dollars, but maybe in five years, it can be used for useful things — for things around the house, for stuff in your workplace — and it won't cost as much. So right now, it's just a way for people to get to see what maybe will be available to them in the future — like video cameras. A long time ago, they were very expensive and nobody knew how to use them ... (Kelly, Interview, San Francisco, March 1996).

This construction of audiences in retail sites creates and sustains multiple markets for 'the virtual'. This is worked through in processes of innovation and entrepreneurial investment phases of commodity production. At the same time, both consumers and operators resist operational discourses of the economic, cultural, and technical virtues of VR systems, their transcendental nature and their high exchange value as economic objects as they appear in public sites of consumption. Because consumers and distributors are part of different social worlds, however, their resistance does not automatically make them allies in deconstructing the claims made for virtual reality technologies

and the worlds they engender. Rather, consumers tend to resist on the basis of socially and culturally defined values (counter to the economic value presented them by operators). By contrast, operators resist manufacturers on the basis of the perceived value of the commodity in relation to their model of organisational operation and distribution. How effective these resistances become in terms of affecting the form of virtual reality technologies, and how the production of those technologies is organised, is the subject of the next section.

Conclusions

The organisation of virtual reality technologies across domains of production and consumption is a series of relationships in which virtual technologies as artefacts act as metaphors or texts for networks of audiences, distributors and producers, and the boundaries amongst social groups. Virtual systems thereby embody institutionalised economic relations under which they operate, and draw together producers, distributors and audiences in 'culture industries'.

How virtual reality technologies continue to develop as widespread and publicly available products depends very much on how they are currently deployed in the public domain. In the pedagogies of 'virtual cultures' at location-based virtual reality sites, negotiating social and cultural boundaries of selves, experiences and embodiment is enabled by certain kinds of institutional arrangements, as well as regulated and constrained by them. Regimes of pleasure come together in leisure sites both as an element of the 'carnavalesque' elements of VR systems as leisure spectacles, and simultaneously to secure a profit for the operators of entertainment businesses.

At the moment, public virtual reality systems are circulated in locations which constitute markets with a number of different sites and actors, all of whom position themselves in relation to VR as a multiple object. The operators and staff in sites of virtual reality consumption assume (like VR producers), *a priori*, that the development of VR as a leisure commodity is an inevitable technical development, and inevitable economic location for such technologies. A self fulfilling prophecy is created: or it would be, if people and the markets they form were entirely self interested, goal directed and rational.

The institutionalisation of these technologies is uneven across different sites. Key differences between the organisation of sites such as galleries and arcades are how techno-economic networks are organised and embodied as cultural commodities, and the models of business associated with consumption and commodity exchange. In this negotiation of organisation, a range of spaces are opened up both for the practice of particular economic models, and simultaneously for resistance to them. On the one hand, staff in sites use cultural knowledge and skills to create desires for consumption. They are at present a necessary adjunct to difficult and sometimes intimidating technologies in location-based sites. As they work, they carry out the goals of the operators whose interests are in the cultural elaboration of 'the virtual' towards a return on their economic investments. As operators/distributors invest in VR systems as leisure enterprises, they mediate between the manufacturers of such technologies and the potential audiences for them. Operators are therefore 'brokers' in networks of 'production' and 'consumption' of cultural artefacts, who elaborate the form of virtual systems as cultural as well as economic objects. Distributors are a social 'interface' between 'designers'/ 'manufacturers' and 'users'. Their multiple positions, and the organisation of virtual reality sites in fact confound such categories.

On the one hand, operators have significant cultural influence in the form of virtual systems as commodities, because the technical systems themselves can't be appropriated *out* of the sites they occupy, or subverted for some other end (unlike the ways that other technologies such as video recorders or computers can be appropriated to ends other than those imagined by either their creators or distributors). The scope for negotiation of VR as a commodity system are all but non-existent in these sites.

It is not so simple, however, to claim that operators 'have' cultural power in sites of VR distribution (see, for example, Kramarae, 1995), and are therefore promulgating particular ideological investments to passive consumers. As I have argued so far, consumers of virtual worlds resist such positioning. In addition, the economic investments of operators are more unstable and risky than an economic rationalist explanation allows. Operators are consumers as well as producers. While on the one hand operators reinforce desires of commodity consumption for the profit of the corporations or franchises they own and operate, they are also themselves positioned as consumers of VR manufacturing companies, and subject to those same discourses in networks of relation with others. Operators are

therefore subject to the operation of VR technologies as commodity products, even if their desires are for economic return rather than bodily experience.

While operators have discretion as to what systems they offer and how they are organised in location-based space, their audiences are critical and do not consume simply because the opportunity is provided. Even if a range of experiences is offered, which might appeal to different audiences, and a range of activities other than virtual realities provided, there are no guarantees that audiences will consume. In some cases, this has meant operations have closed down. Digital Realities was an extensive themed operation with multiple locations across North America and Europe. Ultimately, however, the virtual experiences it offered were not sufficient for significant consumption on the part of the public in North America.

Such instability in the location-based entertainment market has prompted producers and (some) distributors to attempt the move into home-based entertainment: to bypass 'old' forms of digital public entertainment and further emulate a different arm of an already established electronics industry which privatises computer-based leisure. The change of site, and of organisation, are important influences in the form of the object. The move from the economically fraught process of distributing mass virtual experiences in a theme park with staff, to distributing technical packages for private consumption can extend the reach of VR into private as well as public spheres.

Not all publicly available VR is located in location-based sites, nor is it commodified. Some individuals, for example, put their worlds on the world wide web, or distribute them via some other electronic means, for public access. The world Doug Faxon built of his childhood home, which he shared with his family by sending them floppy disks, and his 'Escher world', are both distributed on floppy disk with Linda Jacobson's (1994) book *Garage Virtual Reality*. This distribution disintegrates the public/ private division that currently dominates immersive VR, and shifts the consumption of worlds to privatised sites — at the same time as it creates connections between people rather than between individuals and abstracted experiences. Such systems of production and distribution are more open to 'grassroots' appropriation. Access to virtual worlds in this approach does not depend on location-based access and exchange value, but on distributed access to computer networks or communities of VR interest. At the same time this organisation extends the scope of VR into private leisure and consumption. This move both elaborates the scope of VR's potential cultural impact (both in the challenge to everyday

boundaries and where it solidifies them), and at the same time shifts the focus of 'the virtual' from corporate or business models of commodities and consumption to interpersonal and participatory oriented 'community' interaction around the technical system.

Distribution therefore becomes part of production via the process of organising exchange, and in the process deconstructs the categories of production and consumption. An exploration of the operation of sites demonstrates how virtual systems, as multiple objects, can best be analysed through utilising the conceptual apparatus of a number of different approaches to cultural and organisational research in technology studies. How such approaches can be extended to consider the connections between sites of consumption and sites of production is the subject of the next chapters.

Section Three

Locating the Virtual

Conclusions

“the audience” is a discursive construct, a set of “invisible fictions” produced institutionally, according to the needs and purposes of the imagining institutions ... The industries ... need not only to represent audiences, but to enter into relationships with them, in the interests of survival and profit. The problem for the [media] industries ... is that they must talk about something to someone, but that someone is literally unknowable. Thus the audience fictions produced in and for the culture industries are primarily designed to reassure producers that the audience is controllable.

Elizabeth Traube *Making and Selling Culture*

The institutionalisation of virtual systems relies both on the conventions and organisation of already familiar social worlds for their impetus, and entails the institutionalisation of new sites, audiences and markets. Diverse subject positions are offered to consumers through competing technical, economic and cultural practices. These can establish new conventions of virtual identities and experiences, and offer a number of different spaces for their articulation, but also remain shot through with familiar operational categories of identity and bodily practices.

Examining the activities taking place at the sites where virtual reality technologies are used draws attention to the inevitability of material and

organic embodiment in virtual systems (Kendrick, 1996; Markely, 1996; Stone, 1991, 1996). The spectacles available in sites draw potential participants into the desire for consumption, for otherness, for subject positions 'outside' the everyday. The regulation of bodies in sites, and the disciplines necessary to achieve the relevant skills for the fulfilment of desire, position participants as consumers of commodities (whether those commodities are 'high' or 'low' cultural objects). Such activities in location-based VR consumption contextualise the construction of embodiment with respect to how bodies are positioned not only in 'space', but in particular 'places'/ locations/ sites. On the one hand, when virtual reality technologies become commodified items for consumption in cultural industries, nuances of meaning and the complexity and diversity of embodiment is subsumed to a logic of 'experience' — a 'vicarious experience', one which is lived indirectly, through multiple media.

On the other hand, as cultural objects and the sites of social experiences, the different systems acquire different value depending on the history of the sites and their social worlds, the durability of the activities associated with them, and whether VR technologies are considered economic or cultural objects in those sites. Operators call some of the systems 'dinosaurs' not simply because they are using their own critical faculties to evaluate the technical aspects of the system against their received cultural knowledge and their perception of the system's role in the economic network they are trying to establish. They also call them dinosaurs because the machines do not always effectively bring together desired meanings and practices around 'the virtual' which incites the desire to consume. Virtual realities are far more elaborated as cultural and economic than as technical objects in many sites of public consumption.

The process of associating cultural meaning, economic value and technical systems together often employs dominant discourses of technical progress (the technical determination of subjective desires) and the sublime fulfilment of 'consuming desires' via commodities. How subjects learn the 'appropriate' behaviours to employ when consuming VR, how they learn the economic system in which the technologies are embedded (or how this is specifically configured in VR sites), and how they learn the appropriate meanings of VR around certain themes, are all disciplined by the ways that the sites are set up as spectacles, as social worlds, and the interpersonal relationships made available within them.

Clearly then, distributors act as brokers in the institutionalisation of virtual worlds in 'everyday life'. They have discretionary power in terms of the way publicly available virtual realities are presented, in what discourses they are positioned and what social practices they are aligned with. Operators are themselves, though, subject to a sales pitch from VR manufacturing firms, the systems' producers. As is evident from the material presented in this chapter, various struggles emerge amongst groups in these sites. The organisation of distribution therefore impacts significantly on the form that the technical object takes in the process of production.

Given the complexity of multiple social groups occupying multiple social positions and roles in relation to each other, an approach which explores the numerous social and cultural connections between 'production' and 'consumption' is required. I have therefore attempted to move towards an approach which stressed the connections between different groups and their fractured and changing relations with each other, and the contingency of the social worlds of sites and spectacles.

Exploring the local and concrete work that is carried out at galleries, theme parks and arcades, suggests that such complexity confounds easy analytical categorisation of 'production' and 'consumption' work. It seems that staff, management and operators in leisure sites occupy multiple, shifting and sometimes contradictory positions with regard to their 'others'. In stressing the *networks* amongst groups, I have attempted to move towards approaches such as organisational network theories, and theories from science and technology studies (variously described as actor network approaches) to capture some of the ambiguity of collective boundaries. At the same time however, it is clear that distributors are still working with artefacts/ computer systems which are designed and built elsewhere.

It seems then, that the organisation of design, manufacturing and production become central sites of struggle in the cultural narratives and technical projects of virtual reality technologies. How VR systems as technical objects are produced, how a number of social worlds are thereby embodied, and how issues of 'becoming virtual' are addressed in that process, is the subject of the next section.

Section Four

Building the Virtual

Introduction

Technical change neither results from a structural logic of development that operates beyond the scope of social actors ... nor is it entirely open to voluntary action and various constructions of technology... techno-structures are *produced* within local technology projects ... they are *reproduced* in institutionalized fields, and ... they are *translated* into other fields.

Werner Rammert *New Rules of Sociological Method*

'The higher the technology level, the more there is to fuck up, be honest ... Do you really think there won't be a subculture of the information have-nots? It wasn't a choice between good and bad, order and anarchy. It never is. It's a choice between the good of the powerful and the welfare of the powerless ... I know how to create knowledge ... If I can do that, I have some responsibility to decide what happens when I've done it! If I can. If I have the chance.'

Mary Gentle *Left to his Own Devices*

In *Left To His Own Devices*, the technical knowledge and skills of individuals are positioned against a politics of virtual technologies in which already existing economic and technical relations are important social resources. In this story, local relations of technology production and consumption are played out across global capitalist marketplaces for information technologies, and the production of technologies is a source of social hierarchy and

power.¹ The social and economic practices which construct such marketplaces for virtual reality technologies, and the means by which those techniques are created within networks of productive enterprise, are the subject of this section.

Technical change is both local and global: both the result of material and discursive networks which position individuals culturally and economically in relation to technologies, and a series of connections and interpersonal relations between 'actors' in organisations and institutions. In earlier chapters I concentrated on how virtual embodiments (Chapters Three and Four) are articulated through cultural narratives, and become embedded in techno-economic activities at specific sites (Chapters Five and Six). While the qualities of virtual subjectivity are made in sites of consumption, the qualities of the virtual systems which generate 'virtual' subjects are made elsewhere.² I had a number of questions about the process of constructing the virtual which could not be answered in sites where I explored the consumption of virtual systems. How was it that the machines came to take the (differentiated) forms they do? What social relations facilitated these technologies?

In Section Four, I want to extend my argument to address these questions about how VR systems are produced. I explore how virtual reality technologies come to be built the way they are, and the identity/ power effects entailed in that process of production. Technical systems, like embodiment, are an effect of social life (Wajcman, 1991; MacKenzie and Wajcman, 1985). The power relations that constitute virtual selves, and the categories of identity and reality they generate, are maintained and reworked through competing versions of technical artefacts. I am interested in who designs and builds those artefacts, what skills are needed, and the technical discourses (re)produced in the process. Practices of the virtual, the real, identity and embodiment are assumed, created and contested in the building of VR systems. What interpersonal and organisational dynamics structure their production? How are relations between production and consumption, knowledge and power conceived in this organisational field? Who are the stakeholders in this process, and what are their stakes?³

To explore these questions, I began to follow the objects/ artefacts I initially encountered to the companies which are the locations of their (physical) production. The conceptual connection I was following was a link in which 'activity' and 'meaning' about virtual systems were at least partially dispersed amongst a number of organisations and sites. Following this

connection, my focus encompassed the communities and social worlds associated with a range of institutional locations of 'production'.

As I explored businesses, universities and informal collectivities such as special interest groups, I heard a number of stories about what it meant to build virtual realities, and how it was to be achieved. On the one hand, some people were telling stories about how to make bits of computer componentry work together to create virtual systems:

[T]he production floor seemed to consist of groups of young men, and some young women, strolling around, fiddling with the bits and pieces strewn all over the place ... The first section was where circuit boards were assembled. They were fascinating, each one a tiny, bustling city of roads, bridges and buildings on a bright green field. Most of the power lay not in the boards, but in the little integrated circuits, or 'chips' — thin wafers of silicon, some containing millions of transistors, more computing power than had sent man to the moon.

Next to it was a section where the headsets were put together from miniature circuit boards and tiny liquid crystal displays. Then came the assembly of the computers themselves, and finally a complicated array of testing equipment to make sure the whole thing worked. There was no noise of working machinery, just the ubiquitous babble of a radio (Ridpath, 1996: 100).⁴

These accounts of virtual systems building as computer programming and engineering appeared on bulletin boards and newsgroups on the internet, as much as they did in works of fiction, or in university engineering textbooks. Others, however, were talking about the politics of making *people* work together to produce *technologies*. Here again, these stories were matters of public discourse, in public meetings, as well as in movies or magazines about the politics of communications technologies at a 'grassroots' level, as well as private conversations in technology organisations. Karin August talks about a project put together by VRASP (Virtual Reality Association of Students and Professionals), a world called Universum, in terms which foreground the collective construction of virtual worlds:

VRASP members were all working in different software ... but we really wanted to do a collaborative project because no-one had all of the skills necessary to really create the whole world and to figure a system ... We tried to create an experiment of a virtual world, that would link other virtual worlds, created in other virtual reality software ... We had thirty people. I don't really know that any VR projects have ever had that many people, especially volunteers who know absolutely nothing about anything, working on it ... (Karin August, Interview, San Jose, September 1996).

Still others were talking about how to build business organisations. Virtuality®, for example, talks in its public relations statements about

building a corporate body, as the same time as it creates the bodies of its technology:

'I want this company to be the world leader in the development of low cost virtual reality technology, the medium that will help remove the communication barriers between people and computers.' Dr. Jon Waldern, Founder and Chief Technology Officer

Virtuality's core business objectives are to: generate financial gains for shareholders by creating a high margin, high turnover business by the end of the decade: build Virtuality as an international brand and to participate in the development of global virtual reality standards: maximise the efficiency of the group by achieving high revenues per employee.

The group's strategy to achieve these objectives: to remain the world's leading VR entertainment company by continually refining its technologies and improving price/ performance ratios: to create a compatible range of VR products which will compete for a significant share in evolving VR markets: to license its proprietary VR technologies to strategic partners in a wide variety of industries: to recruit highly talented individuals and provide them with an environment which encourages innovation and responsibility (Virtuality Group, 1995: inside cover).

These stories were dispersed across sites and activities. At the same time as I saw circuit boards and head mounted displays, I saw boardrooms and cluttered offices, I saw personal computers in home offices and computer labs, I saw lecture theatres and cafés. At the same time as I saw images of digital bodies, I saw millions of lines of code, I saw system diagrams and chips, light tracking systems and pairs of gloves. I heard about patent disputes, read fiction about head mounted displays the size of sunglasses (Gibson, 1993a), and saw prototypes for such systems. I also heard about the franchising deals for them, and listened to marketing plans and timetables. As I talked in company vestibules about the politics of democracy in an information society, I heard cellphone conversations about magazine print run deadlines.

How was I to make sense of such complexity in the production of virtual reality technologies?

I attempted to work with a number of different ways of understanding the stories and activities I encountered. While interactionist and feminist social constructionist traditions initially framed my questions about what I witnessed 'in the field', I was at the time reading 'actor network theory', which radically deconstructed the division between social and technical organisation of production. My questions reflect not only my own intellectual history, but also in part the history of debates in sociology and science and technology studies over the past ten years. My questions about virtual reality technologies are positioned between a number of concerns in these

enterprises, such as the relative determinism of 'technology' and/or 'society'. In what respects do those who build 'technologies' have the power to influence 'society' and precipitate social and cultural change? To what extent are technological conventions of practice 'determined' by social hierarchies? These questions address concerns around 'structure' and 'agency': do technologists 'have' power to 'choose' the material and discursive resources they employ, or do structures/systems determine their actions?

Looking at technologies as social networks of embedded practice counters the tendency to view virtual identities as simply the effects of technical objects. Some treat virtual identities as if they sprang fully formed, if not from the head of Zeus (Sofia, 1992: 14), at least from specific sets of artefacts. Some theories from science and technology studies, particularly those that proposed some (social or technological) determinism, left me dissatisfied with the conceptualisation of technology production. Those theories that focussed on technologists' local activities tended to omit accounts of how their social worlds are reproduced across time and space in relatively stable and institutionalised forms. Others, who concentrated on social 'structure', did so at the expense of the actions of subjects, and the negotiation of technical forms in contingent networks of organisation (Rammert, 1997). Moreover, with a few notable exceptions (see, for example, Woolgar, 1991), many analyses in science and technology studies tended to be retrospective, whereas I was attempting to make sense of technical change as it happened.

My response to these dilemmas has been to attempt analytic strategies which utilise aspects of 'actor-network theory'⁵ and a feminist social constructionism, and develop some of the productive tensions between these approaches. My starting point has been that any technical development or innovation is a hybrid of social practices in which the social is written into the technical, and in which the technical provides opportunities for new forms of social relationship. Technical design and production processes are always heterogeneous (Law, 1987). The answers to any set of technical, design or production questions are simultaneously cultural, economic, social, textual and political questions.⁶ Any technology — any network of actors, practices, objects, texts and relationships — are produced by 'heterogeneous networks'. John Law (1987: 113) argues that

the stability and form of artifacts should be seen as a function of the interaction of heterogeneous elements as these are shaped and assimilated into a network ... an explanation of technological form rests on a study of both the conditions and the tactics of systems building. Because the tactics depend ...

on the interrelation of a range of disparate elements of varying degrees of malleability, I ... suggest that the product be seen as a network of juxtaposed components.

Furthermore, those heterogeneous practices can only be traced in concrete contexts. My concern is to deconstruct the dichotomy of the technical and the socio-cultural, by rearranging the formalised histories which are (re)constructed by VR industries, and make different kinds of connections, tell different stories about how machines, their creators and users are associated.

The theoretical subtext in this process is to consider relations of power (Law, 1991) in the construction of technical systems. The aim in considering technologies as networks is to heuristically 'flatten' or make 'symmetrical' (see Callon, 1987) the theoretical consideration of technologies — to treat humans and non-humans equally, and attribute to all elements equal importance in the creation of technical artefacts.⁷ Feminist scholars have argued that 'flattening' by the analysis in this way, and in particular by focussing on the goals and practices of technologists, actor network theory neglects the work that is done by 'others' in the production of technologies, and in doing so marginalises them.⁸ Moreover, they argue that actor network theory refuses to examine why it is that some ways of seeing the world reproduce unequal power relationships (Martin, 1996).⁹

While I want to pay heuristic heed to 'actor network theory' as a *general* framework for this section, I want to argue, along with Joan Fujimura and Susan Leigh Star (1995: 29), that

I am still sociologically interested in understanding why and how some human perspectives win over others in the construction of technologies and truths, why and how some human actors will go along with the will of other actors, and why and how some human actors resist being enrolled ... I want to take sides, to take stands.

While I want to draw on the insights of 'actor network theory', its insistence on the complexity of networks and its attention to the concrete and local, I also want to work with feminist science and technology studies to foreground the power relations of constructing (virtual) selves in situatedness and multiplicity. I am interested in what relations of power are enabled or constrained by the form of the machine, and made to 'endure' beyond their use in the enactment of a human/computer system. Certainly artefacts have politics (Winner, 1986),¹⁰ and as I have argued in preceding sections, those politics can occur at the level of minute gestures. What competing agendas,

strategies and techniques are played out in how the machines are put together? What standards and conventions are formulated? Who gets to say that 'the virtual' is defined technically, and in what contexts?

Paying attention to 'heterogeneity' does not mean that 'anything goes' (Law, 1991). A heuristic flattening does not necessitate political relativity. One way of threading a path between questions of power and marginality, while examining the networks which comprise technologies, is to move between the local and material construction of objects, and how these are defined through discursive categories amongst institutions and organisations. This is a move 'between' the 'micro-negotiation' of technical systems, and wider patterns of technical production and organisation in diverse markets.

My strategy in the following chapters is to examine the artefacts I have already introduced, and to continue to draw out the similarities and differences amongst the ways they are built.¹¹ In doing so, I want to deconstruct and examine the ways that artefacts become 'hardened'.¹² I am interested in how social relationships become 'durable' in objects (Latour, 1991), as well as how objects are contested, and sometimes do not become durable (Latour, 1996). I want to explore how the practices of artefact building both draw from and rework the economic and cultural relationships between creators, users and their intermediaries, already explored in previous chapters.

So far, I have linked machines, their users and distributors through already familiar social worlds in entertainment and art, with notions of identity already entrenched in social life, as well as with new configurations of worlds and ways of talking and thinking about self and embodiment. Chapter Seven of this section explores such issues through looking at the links between technical systems and organisational/ economic relations of production in the fields of entertainment and art. Firstly, the chapter draws together some of the organisational stories told by those in VR communities. In doing so, the chapter addresses how organisational networks can both enable and constrain technologies in particular directions of innovation and change. In particular, I draw on the notion of markets to indicate how the creation of subject positions in organisational networks such as those in 'markets' can frame what kinds of virtual reality technologies are produced. Finally in Chapter Seven, I will address how these organisational networks are embedded in wider institutionalised systems of collaboration and conflict which frame a 'field' of relations, across which the local organisation of production is played out.

In Chapter Eight, the specifically technical aspects of this organisation and institutionalisation will be addressed. The chapter will examine the modes of knowledge and skills which inform the creation of virtual reality technologies, how these are embedded in institutions of education and business, and the links between these fields. As the section moves towards its conclusion, the theoretical and political issues that have been identified in the chapters are reiterated explicitly as themes in the thesis. The organisational structuring of VR production through sets of positional oppositions (production/ consumption, expert/ inexpert, legitimate/ illegitimate) prompts a range of artefactual forms for virtual reality systems. Understanding the connections between meanings and activities at different sites points to how VR is both diverse, and negotiated across local and institutional networks. The differences amongst VR systems foreground issues of 'access', as well as the politics of meaning and knowledge production. The knowledge and activities which provide an organisational field for VR production frame the virtual bodies and identities ultimately generated by participation in virtual systems. These bodies and identities are contextually constructed from necessarily diverse technologies, and are thereby also moments of struggle. These moments of struggle can be explicitly identified in local technology projects by listening to the stories told by those who build virtual systems.

Organising the Virtual:

Networks, Markets and the Politics of Positioning

One of the abiding fictions of cyberspace — of all technologies really — is that it can cut rather than untie the knot of present-day problems. In this respect, cyberspace gives a new form to an age-old dream: that through our ingenuity humanity can devise products and riches in excess of the resources required to manufacture and maintain them ...

Robert Markley *History, Theory and Virtual Reality*

‘We run out of cash in September.’

‘Are you sure?’ ...

I asked for more numbers - breakdown of sales by customer, debtors outstanding, information on margins, research and development expenditure by product, stock positions, the lot ... I knew that small companies usually have a poor idea of what their true financial position is...

‘Can we cut R & D any further?’

‘I don’t think so ... The cash is needed to finish what we’re already working on. If we stand still, then we’ll quickly lose our revenue.’

He was right. A company like FairSystems was nothing if it stopped developing new products.

Michael Ridpath *Trading Reality*

As we have seen thus far, virtual systems take a range of physical and discursive forms. The above scene suggests that the shape of technologies is crucially dependent on the forms of social and economic organisation which enable technical production. This chapter addresses how virtual reality

systems come to have social and cultural effects when they are differentiated through a range of organisational networks. The collective organisation of artefactual production is crucial in an analysis of how 'the virtual' becomes articulated and institutionalised (Hirsch, 1972). How these artefacts are built, and the social relationships established as they are built, provide the range of possibilities for distribution and consumption.

This chapter addresses a range of organisational questions. What are the organisational relationships through which virtual systems come to be made available in particular forms? What is at stake for the actors involved, and how do they form relationships around VR production? I am interested in the 'interfaces' between distributors, producers and consumers, and how those interfaces shift. What seems crucial is the institutional frameworks/ fields provided for technology development, and how those fields are institutionally defined by those involved. If technologies are an *effect* of already stabilised networks of relations (Latour, 1987), then what social conditions facilitate particular effects, and what new effects are produced by shifting relationships?

My interest in asking questions about the social organisation of VR production had two geneeses. My first concern arose from talking to people who make virtual reality technologies. When asked about how they developed and built artefacts, people in the industry told stories about 'how to run a business', or 'how to manage a project'. Unsurprisingly, a number of contradictory stories were presented to me about how productive organisation is achieved, and how the technologies, their users and producers are positioned by that organisation. In this chapter I trace some of these stories.

In a fictionalised account of the VR industry, two characters discuss the intentions of the founder of the VR firm, killed in a case of industrial espionage:

I listened in silence ...

'He wanted to be the man responsible for introducing virtual reality into the very fabric of society. That's not just a problem of electronics and software design. It's a problem of management, of marketing, of product development, of strategy, and of finance. And that makes it harder ... (Ridpath, 1996: 228).

In Ridpath's novel, it is assumed that virtual reality technologies will be 'introduced into the very fabric of society' through the agency of private enterprise, within a deregulated and competitive capitalist system. This

fictionalised account of VR production also highlights some of the economic and organisational issues which directly impinge on the production of VR systems. *Virtuality®*, one of my fieldwork sites, was a case where building technical artefacts was presented in terms of entrepreneurship and the construction of a profit-making enterprise. One of the founders, Jon Waldern, maintains that his goal was to progressively build a company:

[T]he plan of the company always was ... the first ten years to learn about VR having decided in 1980 that that's what I wanted to do, and the second ten years is split in two, the first five to build a company to be able to fund the R&D necessary for the second five years, its a twenty year plan to deliver VR ... If I can get that on my gravestone, I'm happy (Interview, Palo Alto, June 1996).

As an 'inventor-entrepreneur' (Hughes, 1987: 62), an individual who both institutes and develops not only the technical, but also the economic, political and social elements of technological networks, Waldern simultaneously prioritises technological innovation, and economic and organisational development. His agenda is to simultaneously build a VR system, a commodity and a company. In doing so he is conscious of his own position in this new field.

In the case of *OSMOSE©* and *Placeholder*, by contrast, organisational and economic concerns are specifically ignored when the artists are talking about what they do. In such cases, the artists explicitly criticise the commercialism of entrepreneurial and venture-funded VR, and the 'commercial' content of those worlds. Char Davies, of *Softimage® Inc.*, positions *OSMOSE©*, even in its conceptual and developmental stages, as a specific alternative to commercially available worlds such as those produced in entertainment industries. *OSMOSE©* is thereby positioned outside (and in contrast to) the organisational strictures of commercial firms through a strategy of de-emphasising *OSMOSE©*'s reliance on commercial enterprise. Davies' aesthetic reflections on *OSMOSE©* positions it as a material entity without economic history (Markley, 1996).

By contrast again, those who build home VR talk about how they organise their system production with reference to the organisation of informal interest groups, but characterise 'industry' and 'interest' as a mutually exclusive duality. 'Industry' is seen as comprised of firms and institutional (university, military) research. They define themselves as outside the boundaries of that descriptive category.

I encountered several problems as I tried to understand the sometimes conflicting stories I was told. On the one hand, science and technology literatures tended towards interactionist and interpretive social constructionism focusing on the local and concrete (Clarke and Gerson, 1990; Knorr-Cetina, 1983) construction of facts and artefacts. It seemed that this theoretical story de-emphasised the 'institutionalised fields' where relations of (economic and cultural) power enabled the (technical) activities of some projects at the expense of others (Rammert, 1997). On the other hand, those approaches which located technical projects within social structures of corporate capital tended to focus on the straightforward reproduction of inequality in labour, gender relations, and issues of hierarchically organised access to technics and technical knowledges: the reproduction of social inequalities through the artefact were rendered as abstract processes.¹ The stories I was hearing were situated across both these domains.

As I indicated at the start of this section, my solution to these difficulties has been to attempt to address technologies and the organisations in which they are embedded as networks. To reiterate, in the view of actor-network theorists (Law, 1987; Callon, 1987; Latour, 1983, 1991, 1992; Callon and Latour, 1981), a particular set of objects embodies many heterogeneous elements, comprised of not only technical, but also social, political, economic, interpersonal, organisational and even textual elements which need to be engineered into objects in heterogeneous ways. The heterogeneous elements at work include accounting systems, marketing strategies and markets, health and safety guidelines, and inter-organisational financing, as well as the labour of hundreds of people. The technologies don't 'work' when any of these are left out. Objects become different — both physically and discursively — depending on the networks of interpersonal and institutional relationships in which they are embedded. These processes generate variation amongst technologies, and the legitimacy of particular forms of technology.

To investigate how virtual reality technologies become 'objectified', we need to look closely at how different elements are put together to create an object-system in local contexts, the problems associated with this for the object builders, and the kinds of entities, texts, institutions and knowledges that are connected and contribute to the technologies. This process addresses both 'local technology projects' (specific sites), as well as institutional/organisational fields in which those local technology projects are situated.

This chapter therefore details the ‘interfaces’ between those who make virtual systems possible, and their various audiences, including both distributors and participants. In the first section of this chapter, I describe and explore the ‘local technology projects’ that have produced the virtual technologies and worlds discussed so far. In doing so, I draw out the similarities and differences between them in terms of the social and economic organisation of technical production. I talk about the micro-negotiation of technical production at the level of firms, projects and informal collectivities, and how people mobilise material resources, discursive strategies and interpersonal relations to establish a techno-economic network that comes to be called a technology. I think in particular about how variation emerges in virtual reality technologies through the relative tenacity of organisational links (coupling). I argue that there are both similarities and differences between these cases, and that specific stories are used to legitimise the particular technical systems which result from organisational contingencies. This chapter will outline approaches to conceptualising collective relationships of production in VR organisations and markets. Firms, and other ‘organisations’² provide an institutional field in which artefacts are negotiated.

In the second section, I consider one particular organisational strategy which disrupts the conventional boundaries of ‘actors’ and ‘organisations’: the concept of ‘markets’ (Callon, 1997). I examine a dual strategy of positioning in the production of VR. The first strategy is to draw on the labour of users as workers in the organisation to stabilise virtual realities as economic products (which is to ‘script in’ this labour in the form of the artefact). The second strategy is to rework the organisation of the boundaries of expert and non-expert, producer and user. VR builders move across different social worlds, and in doing so create hybrid networks of technics, thereby bringing a number of worlds, texts and conventions together.

In the third section, I want to address how relationship networks are embedded in organisational and economic fields. I want first to describe some of the relations of competition, cooperation and strategic alliance in which the production of virtual reality technologies is organised, and how the always already existing social relations of economic exchange and circulation impact on how VR technologies are produced as ‘techno-economic networks’. I want to argue throughout this section that how technical objects are embedded in networks matters, both for what kinds of objects get produced,

and thus how people are economically and culturally positioned as ‘virtual subjects’.

Organising a Techno-Economic Network

Different actors with different resources following different rules can be ascribed to local projects of technology design ... Science-based knowledge, technological experience, money, influence and trust are some of the critical resources. The actors belong to different social worlds and follow rules of truth verification, technological efficiency, economical profitability, political dominance, and cultural meaningfulness ... Local technology projects need powerful coalitions building and convincing legitimizing to gain acceptance and to get carried out.

Werner Rammert *New Rules of Sociological Method*

Like biotechnology firms, virtual reality organisations have ‘an unusual cast of actors — academic scientists, entrepreneurs, and financiers — in the industry’s startup’ (Powell and Brantley, 1992: 367). The individuals and collectivities who produce virtual reality technologies tell a number of competing and sometimes conflicting stories about the ways they mobilise resources to produce immersive virtual reality systems. As Rammert (1997) notes, these stories, alongside the organisation of people and machines, are resources which are mobilised to maintain and legitimate particular production practices.

As we have seen in earlier chapters, the physical artefacts called ‘immersive virtual reality technologies’ are not closed physical systems, but rather techno-social processes with porous and shifting boundaries. As such, their constituent elements can be combined and socially embedded in a number of ways. Organisations must be *created*, a new set of relationships carved out of an already existing institutional field of both formal and informal ties. Some already existing relationships are reinforced, while others are created through new ways to situate both objects and people in relation to each other in technical production. Similarities and differences in organisational form amongst sites enable some forms of virtuality and constrain others. How objects are embedded in collective relationships, and how they vary as a result, depends on fitting a new organisation into already existing associations amongst other networks, and in mobilising resources in those networks.

When Jon Waldern, one of the founders of Virtuality®, successfully convinces his friends to join him in creating a virtual reality manufacturing

company, he is attempting to organise — cajole, bully, or otherwise persuade ('enrol') — one element of a range of entities which, in association, will become physical artefacts. These entities include polymers and balance sheets, lenses and electrical pulses, a variety of technical objects, business contacts, academic and research networks, knowledge of what else is happening in the industry and a division of labour between themselves (Law, 1987).

All of the cases in my research are similar in that they aim to mobilise conventions of technical expertise, knowledge and institutional histories to organise productive collectivities, from a division of labour in already established industries and institutional histories. There are some common assumptions about available resources. Garage projects, as well as OSMOSE© and Placeholder, like the case of Virtuality®, can all assume the availability of some technical materials. They can assume an already existing division of skilled labour, and a history of both knowledge and artefactual production in computing industries (see Chapter Eight): they don't have to keep re-inventing the silicon chip to build virtual systems. Similarly, they can assume systems of financing and economic exchange, a history and accumulated conventions of labour relations, protocols for research and development and means of knowledge exchange and communication (as well as collectively formulated protections for privatised knowledge) (Nohria, 1992). Some elements of technical production, such as semiconductor technologies, or standardised accounting practices, or capitalist systems of economic exchange, are already embedded in sets of relationships, such as computer processors, which VR producers can access relatively easily. These technical elements are common certainties amongst organisations, and form one part of an 'organisational field': that is, a

community of organizations that have some functional interest in common — for instance, criminal justice, or mental health, or the manufacture and sale of computers. Membership in an organizational field is not limited to organizations directly involved in developing, producing, or distributing the products or services associated with a functional area; fields also include organizations that provide funding, that have regulatory oversight, and that offer ancillary services (Barley, Freeman and Hybels, 1992: 313).

At the same time, there are different uncertainties confronting each of the organisations I have explored in my research (DiMaggio, 1992; Nohria, 1992a). These different uncertainties present different problems for each organisation, and influence the ways in which firms, and other collectivities, establish legitimacy and control in their ventures.

What organisations such as Virtuality®, Softimage® Inc., Interval or garage organisations *can't* assume is a set of relationships to make their object/ 'product' economically viable, a pre-existing set of markets or audiences, or workable internal and external organisations. The *particular* strategic response to the fundamental uncertainties of technical/ cultural industry systems (Lewis, 1986) formulated by Virtuality® which differentiates them from other cases, is the formation of an entrepreneurial, 'venture-funded' firm. Throughout the process of establishing this firm, the technical prototype becomes a *product* for commercial resale, which prompts various other strategies to make the organisation durable. When solving 'technical' problems (see Chapter Eight), collectivities³ don't only have to think about speed and graphics capabilities, they also have to think about commercial reliability and how often the machine is likely to break down, if and how it might be serviced, its cost as a percentage in the financial system, and how this affects its retail value. When they think about HMDs, they not only have to think about the associations of screens, optics, and software, but also the cost of different componentry, how to build strong and simple-to-use casings for expensive and fragile optics, and whether those who have the major functional responsibility for those optics should be most closely associated with the people who develop the new tracking systems, or the people who write the software which enables the graphics display. And how to put all the componentry together?: a process which, at Virtuality®, is still done for each individual unit, by hand, in a large concrete-floored room in Leicester with boxes of wires and cables ranged on shelves around the walls, and machines in various stages of completion with their guts hanging out everywhere. And so on, and so forth, for every element of the new technical object.

Network Building

The artefacts and relations in a socio-technical network become organisationally stable and relatively durable (even though they change over time), and to this extent the artefacts generated by them become 'black boxes' (Latour, 1987): technical and social associations which can be taken for granted and mobilised as resources in the formation of further networks. As Rammert (1997: 179) notes, '[w]ell-known artifacts and routines of construction are thus experimentally recombined to build new combinations, or are transferred to different contexts of experience and use.' In each case, in

the initial stages of group formation, the most important resources are human beings whose skills are needed to integrate elements of the nascent system.

In the particular case of Virtuality®, a new collective network is created from a number of social worlds — those of engineering, computer programming and entrepreneurship — in the form of a legal firm, embedded in a loosely connected organisational field of virtual reality research and interest. In March 1991, W. Industries Ltd. (later to become Virtuality® Group plc) released their first virtual reality location-based entertainment units to acclaim and awards. This was the first commercially available virtual reality system for location-based entertainment, at a 'workable' cost to producers, distributors and consumers.⁴ In England, where Virtuality® emerged, virtual reality technologies were most often small specialised projects within wider collectivities with diverse interests (such as military, university or graphics industry research). They were also positioned in relation to the more informal collectivities devoted to an infant technical community (such as special interest groups). These sites were relatively small, geographically isolated, and along with the military development of simulator technology, were of only specialised interest in the pursuit of other goals. Virtuality®'s uncertainties were specific to building a firm in this institutional milieu.

While Virtuality®'s technical systems emerged in the formation of an entrepreneurial firm, OSMOSE©'s emerged in art worlds. On the surface, worlds of art are very different to those of business and commodity production, or engineering and programming. An 'art' field foregrounds the role of culture and aesthetics, and downplays the economic or commercial aspects of art production. More than a cursory examination, however, reveals a number of organisational similarities. Howard Becker (1982) notes that 'art worlds' are networks of collective activity which involve drawing together disparate, sometimes contradictory, and sometimes hostile elements.

The OSMOSE© project group at Softimage® Inc. utilise many of the same material/ technical resources, skills, knowledge, distribution networks, media coverage and industry/ community relationships as entrepreneurial entertainment companies like Virtuality®. Virtuality® and the project group at Softimage® Inc. are therefore similar to the extent that they share standards and conventions which organise technical production. OSMOSE© must negotiate with the conventions of negotiating resources and personnel in a *corporate* rather than entrepreneurial environment. Because it is situated within a project oriented corporate environment, the uncertainties it faces are

somewhat different to those of Virtuality®, and the strategies the group employs to minimise those uncertainties also differs.

Char Davies, the artist and project leader for OSMOSE®, joined Softimage® Inc. in 1987. Softimage® Inc., the company that produced OSMOSE®, is based in Montréal, Canada, and develops computer animation software for a number of different markets, such as games developers and motion picture industries. Softimage® Inc. is not a company that specialises in VR, but is nevertheless a prominent player in the North American graphics industry, and therefore has the resources and already established networks of relations to fund and produce specialised and singular projects such as OSMOSE®. As director of 'Visual Research', Davies began solitary work on OSMOSE® at the end of 1993 in the way of initial concepts and aesthetic development. As a potential stand-alone research project, her initial proposal was presented to the company directors and management to gain corporate support and access to financial resources, technologies and personnel.

The resources required by OSMOSE® are substantial. It could probably only have been produced in the context of an institution such as Softimage® Inc. given its high cost in financial and human resources. It seems unlikely that the business (even though it is itself, quite big, with substantial resources) would support development in the arts were it not related to its business goals and its responsibilities to its shareholders (Kushner, 1996). The hardware and software which comprise OSMOSE® *can* become commodified in a similar way to Virtuality®'s entrepreneurial 'products'.⁵ Any number of elements/ components/ devices in OSMOSE® are potentially profit-spinning enterprises for Softimage® Inc. (and eventually for Microsoft®, who bought Softimage® Inc. in 1994). It is therefore in management's interests to support such work, for two reasons.

The first is that the copyrights likely to be had for the software that generates the work are potentially valuable if successful.⁶ The second incentive is an investment in future technology production. OSMOSE® is not only a work of art, but art/ medium in combination with a technical apparatus, embedded in particular social and economic relationships. The potential profit-making enterprise from a business point of view is not so much the content that is produced, but the technical artefacts/ devices and the software techniques/ skills generated in the process of its production. If OSMOSE® is a showcase for what can be achieved with particular combinations of virtual reality technologies as media (Davies and Harrison, 1997), then it is a showcase not only for the hardware (which is produced

elsewhere), but also for the Softimage® Inc.-produced software. As the software is custom built, it is not so much an advertisement for the software itself, but for the knowledges, expertise and skills of the personnel in the company (and those contracted from elsewhere), and the abilities of the company's teams to come up with a very sophisticated product.

The similarities between these cases therefore depend on the degree to which they occupy positions within the same organisational field, and the degree to which their entrepreneurial, corporate and cultural/ institutional networks already overlap. The formation of organisational conventions in both cases relies heavily on a micro-politics of negotiation within a business entity, and a discursive politics of legitimation in wider organisational fields.⁷ According to Rammert (1997: 181),

the successful formation of a techno-structure should be reconstructed as a temporary result of the micro-politics of negotiation between local actors and the macro-social networking between collective actors representing the different institutional fields of society ...

One site where the interests of both entrepreneurial and cultural institutional modes of virtual reality production overlap is in the networks formed by special interest groups and institutional research. Groups such as VeRgE, (Virtual Reality in Education) in San Francisco, or VRASP (Virtual Reality Alliance of Students and Professionals) on the US East Coast, or the newsgroups maintained by HIT (Human Interface Technology) Laboratory at the University of Washington, Seattle, tend to coexist with industry, research and artistic endeavour. Individuals involved in these groups (and/or the organisation of them) are often prominent individuals in firms or research groups, or are allied with a range of organisations through common activities (such as conferences, or local interest meetings), collective (industry) membership, or sponsorship. VRASP, for example, was started by Karin August, along with a regular newsletter *Pixelation*. The activities of the group were purely voluntary, and centred around information sharing, discussion and commentary on virtual reality technology, industry and its relation with other areas of social life.

The commonalities amongst the institutional fields facing emergent organisations in which production takes place enables and constrains the kinds of technology possible. Technologies are differentiated by the form of the fields in which they struggle for positions, and face the task of 'embedding' the network that is established. This process of creating networks

which embed particular technical systems *as* social networks involves utilising and establishing various systems of exchange and circulation (Barley, Freeman and Hybels, 1992). This includes the circulation of financial, human, social and cultural capital.

Organising Capital

Access to different types of ‘capital’ support — including financial, human and symbolic capital resources (or the means to create those resources) (Bourdieu, 1989) — impacts fundamentally on the shape of the technical system organisations are able to make. The variety of cases in my research, and the differences between them, illustrates the different kinds of capital available in institutional fields, and how they can be combined in multiple ways in techno-economic networks.

Financial capital, and the variety of ways in which it can be obtained and maintained, is a crucial issue in the organisation of virtual reality technologies, which affects the form of the artefacts built. The issue is not only the ‘volume’ of financial capital needed, but also the particular form of the relationships brought into play through such circulation. Differential access to a *volume* of financial capital funding and sponsorship, for example, makes a very obvious difference in the technical systems possible, and explains differences in the production of a US \$25,000 unit in dedicated development from Virtuality®, and a system that cost around US \$500 shown at SIGGRAPH by VRASP.

It is also the case, however, that the *form* of financial support makes a difference in the type and distribution of a technology. Project funding from within a company, as in the case of OSMOSE®, for example, produces a ‘one-off’, expensive product, which is different from an injection of capital funding which must be recouped through product sales as in the case of Virtuality®. Informal networks of friendship and experience heavily supported Davies’ claims to financial resources: her history of work at the company since 1987 and her contributions to its growth, the support of the company’s founder, Daniel Langlois, and his understanding of the potentialities of such research, are all important resources. As will be seen throughout this chapter, the production of such special projects relies heavily on informal organisational dynamics of friendship and trust, as well as economic rationales and formal/contractual relations.

Whereas in Virtuality®'s case access to financial resources depends on establishing formalised contractual relations with other firms and entrepreneurial ventures, in the case of OSMOSE©, project funding relies on the internal networks of the corporate organisation. The development of OSMOSE© is not inconsistent with Softimage® Inc.'s mission statement more generally:

The company's goal is to make the industry's leading tools available to the broadest possible audience of professional digital artists. Softimage is achieving this goal by developing groundbreaking products, inspired by artists and editors, that are transparent to the creative process. The company is also dedicated to forging strong alliance with independent software and hardware developers, offering customers software on a choice of hardware platforms and conducting ongoing research and development that sets the industry pace for future products.

The position of OSMOSE© as a 'special project' within a more generally oriented computer graphics firm is reflected in its more complex design and production methods. Softimage® Inc. produces graphics software for a range of platforms, including the Onyx family of systems, but the software the OSMOSE© ran on was produced specifically for that project. On the one hand, more material and financial resources can be unilaterally directed at a single project in OSMOSE©, and those who produce it therefore have a wide range of choices in where those materials are directed. On the other hand, the production of OSMOSE© is limited by the costs entailed in its production and distribution. The system is bigger, faster and more sophisticated, but far more limited in the audiences it can reach. Like Placeholder,⁸ it can't pay for itself, and so its hardware must be borrowed.

In the case of Virtuality®, financial relations are both formal, contractual agreements (relations made textually durable), and a process of network building on an informal basis. As Waldern notes, after the first prototypes, two years were spent organising financing and gearing up for production. Throughout 1987, while Virtuality®'s first prototype was being built, John Waldern was putting together the first business plan for the company.⁹ While the system was still in its research/prototype stages here, it attracted investment from Wembley plc, a British entertainment conglomerate. In addition, the British Technology groups awarded Virtuality®/ W Industries their 'Best New Business' award in 1988, which added £20,000 to their growing resources for developmental prototyping. This allowed them to move out of the garage and into the first commercial premises.

I wrote the business plan, and then I got the business plan funded. [W]e gave up ... about seventy-five percent of our equity ... I raised three quarters of a million pounds, in those days ... that was quite a lot of money ... Which with no track record, standing stock, no equipment ... was a reasonable presentation. And went from about four to twenty five [personnel] ... in ... the R&D period ...

[W]e actually went underground. We built our first premises in an old mill, in the basement ... We literally went to ground for two years. Total secrecy. We didn't tell anybody about what we were doing ... (Jon Waldern, Interview, Palo Alto, 1996).

The business plan formally states projected methods of association, and by textualising them in a number of ways (through financial statements, company reports, research proposals), attempts to make these sets of associations more durable. Whereas technology prototyping is usually conceptualised as a set of technical problems to be solved progressively, based on received technical traditions and rigorous testing procedures, the content of technological forms stems equally from these organisational and textual strategies. As Constant (1987: 232) claims,

quality, reliability, service, style, economy of operation, expected resale value [as well as economies of scale in the case of the infant W Industries] — all matter, and all are to a major degree a function of organizational decisions and efficacy rather than straightforward technical solutions to straightforward technical problems.

W. Industries could build a technically sophisticated VR system, but if it was to be commercially, rather than simply technically feasible — let alone successful — ongoing factors in the development of an organisation come into play. Part of that development is through the mobilisation of discourses of 'entertainment' to sell Virtuality® systems by gaining cultural legitimacy and popular support, as well as the support of the industry and those powerful within it. In the case of Virtuality®, Waldern comments:

So in that context, we went to ground for two years, we brought the products out on time in 1990, and we launched it, at Wembley. A big show, about 500 people ... [T]here were sixteen machines, we built the first batch of sixteen, built them in two tiers, then linked them all together. And then launched it ... just about every marketing, tv, commercial, entertainment, I mean we stopped counting at at forty million in free advertising and pr, it just kept going. So that was quite the right thing to do, stage an event, and we really were able to put the company on the map, and began trading (Waldern, Interview, Palo Alto, 1996).

Their initial product (the CS1000 unit) (see Fig. 1-1, Chapter One) was the Cyberedge Journal's 'Product of the Year' award winner in 1991, and in December of the same year, Apax Partners, a venture capital group, purchased a majority holding in the company from Wembley and injected £1.4 million for volume production (see Fig. 7-1 for Virtuality®'s first commercial HMD).



Fig. 7-1
Virtuality®'s first commercial HMD
Virtuality (1993) p. 7.
© Virtuality

As W. Industries has become Virtuality® plc Ltd., and as the organisation has gone through a number of permutations in the balancing act between technical, social and economic elements, the company structure has changed. How these local differences are embedded in networks of capital accumulation, exchange and its regulation are the subject of section three in this chapter.

The circulation and exchange of human capital, as well as that of finance, influences the differentiation of organisations and products in the VR industry. For example, the 'garage' organisation of VR production is not organised around formal and contractual labour relations, but is, rather, purely voluntary, organised through informal networks and special interest groups. 'Garage' production depends on the technical means by which a disparate and isolated number of people can come together to put together a VR system out of different and isolated parts:

VRASP created a virtual reality — Universum — for Siggraph in '94. And basically we were interested in the technology and we wanted to try to do something. We figured between ourselves and different groups, we were

operating on the assumption that VR needed a standard ... [W]hat we wanted to be able to do, was take an object or information or an experience of one area of this world, and move it, but we weren't able to accomplish that. The software just couldn't talk to others ... So we had different people working on different segments. Somebody would work on objects. And they would be used anywhere. Somebody would work on the office, taking the object and creating the look of the office. Someone would take information and type it in for the text ... So everybody pretty much works independently and we have occasional meetings where we bring each other up to snuff ... (Karin August, VRASP Organiser, Interview, San Jose, September 1996).

Sometimes these special interest groups are associated with university research groups,¹⁰ but as often they are created by individuals with time and energy to be involved.¹¹ This informal approach differs markedly from the formalised contractual labour relations in firms such as Virtuality®, who employ skilled labour to work in common (although multiple and dispersed) physical sites.¹² The circulation of human capital in relation to VR systems such as the cases of Virtuality® and OSMOSE© depends crucially on how people are organised through strategies such as the business plan or system design, and made durable in contractual employment relations.

To design and build a new prototype, Virtuality® needed to subcontract out the production of specialist component parts to specialist organisations. The polymer casings for the new enclosed units were one of these components, the computer parts of the system (an Amiga platform which was relatively widely available, cheap, versatile, and could be highly customized) was another. They needed to coordinate the production of new componentry such as a new HMD, new tracking devices, graphics cards, and hand input devices. They therefore had to develop new software systems. New people had to be enrolled for specialised tasks, and the organisation of those tasks, and specialisation amongst working groups had to be established. While one group worked on the HMD, now called the 'Visette®', others worked on graphics programming — these were grouped along the lines of functional specialisations within the systems. Systems of knowledge also had to be coordinated; such as marketing and public relations, finance and administration.

The differences between Virtuality® and OSMOSE© in this respect, if any, are the number of employees contracted by the firm at any particular time to work on VR projects, and the lengths of those formal contracts. Furthermore, the dynamics of human labour circulation are expressed in different ways in the decisions the organisations make about how to produce their technologies; for example, whether to make technologies in-house, or to

contract/ buy from others in a network. As Kogut, Shan and Walker (1992: 349) note, a field or market for products

cannot be characterised simply by the degree of competition; rather, it is analyzed as a network with an evolving social structure ... The structure of cooperative relationships influences the distribution of information available to firms about current and potential partners in that network ... Therefore the knowledge of a firm regarding the availability of cooperation with partners in the industry is determined by its position in the network structure. The make-or-cooperate decision is made in the context of a concrete network ...

In a corporate special project such as OSMOSE©, staff are contracted into an already existing company to work on that project, but may be contracted in for a number of years.¹³

The ways the circulation of human capital might work in an entrepreneurial virtual reality company, on the other hand, are summed up in a scene from 'trading reality':

'We don't produce all the programs in-house, do we? Who writes the software? ...

'We're in touch with dozens of software companies, all experts in the particular fields: auto-design, education, military simulation or whatever. We provide them with the FairSystems world-building software, and the FairSystems hardware, and encourage them to design virtual reality applications ... they all stay independent. We can't afford to buy them. We don't want to, and they don't want us to ... There are tiny firms all over the world looking for new ways to use our technology ... We put it all together. We make a lot of money' (Ridpath, 1996: 178-179).

For Virtuality®, technical changes in 'open platform' development need to occur before contracting out is possible. According to Martin,

[O]ne of the strategies behind going to an open platform is that people will be writing direct x platforms which are capable of taking a virtual reality twist on it at a very little extra cost ... So it's going to have the widest possible installation, eventually in the consumer market ... I want to take it and take what you can and have you skew it for virtual reality ... And that's how it'll happen in the future. Yet we'll still have our own software development teams — to write bespoke applications at the request of somebody else or to write software applications that we deem to be necessary for market penetration in VR entertainment. But we are going to be open next year and next year you'll start to see probably a lot more familiar titles on our platform than we had previously (Interview, Palo Alto, September 1996).

VR organisations draw on a range of competing and institutionalised discourses about their objects to legitimise how the exchange and circulation of economic and human capital is organised. In other words, network

builders circulate and exchange symbolic and/ or discursive capital to make their technologies obdurate. As we have seen in Chapter Six, those who *distribute* technologies position those objects in organisational and economic discourses. Those who build the technologies also enact its discursive positioning. They seek legitimacy by establishing rationales and criteria for evaluating the relative 'success' of the product.

According to Waldern, for example, organisational criteria draw on financial as well as technical discourses.

financials make you laugh because they say 'well VR won't happen for many years because...' you know, x, y, z isn't in their criteria. That's only 'cos he's not doing it. Meanwhile we're running a hundred and forty million dollar company here. Doing quite well thank you. I think it depends on what level of criteria you judge your set. Purely technical, or purely financial, or both (Jon Waldern, Interview, Palo Alto, June 1996).

The company's measure of its own success is in terms of stabilising financial, labour and product relationships. How this product is evaluated as 'advanced technology' is therefore as much a product of organisational imperatives and how they are articulated, as it is technical design. As Virtuality®'s object becomes a commodity, and a complex socio-technical system, the methods used to evaluate the new prototype become quite explicitly organisational and commodity based. As Coser, Kadushin and Powell (1982: 177-178) note, finance becomes the basic language of the firm when the bureaucratisation and size diminish social contact within the firm, and when public funding necessitates a responsibility to public shareholders. The success, and therefore value of the product is measured in terms of their ability to produce the object at a price at which people will buy it.

Anyone can do this stuff, it's can you do it at price point, and a level of integrity that is genuinely useful in the marketplace. I'd say anyone could repeat our out-of-home miracles for the public market, but could they do it so that they can stand up 365 days of the year, 7 days a week, and I'd say that would probably take them the other half of the time ...

I think much of our focus and concentration has been on the investment and engineering parameters of developing ... high quality visual and usage... [and] getting it cheap enough to develop it (Jon Waldern, Interview, Palo Alto, June 1996).

Discourses of economic *rationalism* are therefore both an evaluative criteria and a legitimising strategy in the case of Virtuality®. According to neo-classical economics, rational choice theory disaggregates and individualises 'goal directed' economic decision-making. The firm presents its objects as

economically rationalised objects, produced by an economically rationalised firm, deeply embedded in previously successful computing and entertainment industries. Virtuality® draws on discourses about *commodities*, and the organisation which will maximise their technical system as a commodity in (imagined) rational economic systems of exchange. For Martin, the criteria to assess the technical system are those of a rationalised of a commodity.

[T]he only right or wrong can be judged by two points. How much money does it make — on one hand. And then ... that's the most tangible right that you can say — is it good? Did it make a lot of money? Yes, then it's good from a company that is responsible to its shareholders ... then you have another viewpoint which is, was it good or was it bad? So intangible. There's no way of determining whether a VR experience was good or bad (Interview, Palo Alto, September 1996).

These criteria suggest strategies which closely couple particular arrangements of financial and labour exchange, including the firm's boundaries, its conventional procedures and standardised objects, and its corporate identities. It is only when new uncertainties are presented by an organisational field that the durability of this network is called into question — such as changing consumer behaviour, or the supply of semi-conductor technologies, for example. According to Rammert (1997: 182),

[t]echnology projects do not remain unchanged if they enter new fields and are subject to different institutionalized rule-systems. The translation of a project from one field to another requires a reformulation of the concept and a reconfiguration of the technical system. Thereby a new identity of the project is constituted, e.g. the 'research' reactor of the scientific community is transformed into the 'low price' nuclear power plant of the export business and this one shall now be converted into a 'high safety' reactor in the political field.

Virtuality® draw heavily on discourses of economic rationality, however any rationality is 'bounded by the limits posed by the problem of uncertainty' (Rammert, 1997: 179), as well as disrupted by shifting collective fields of social activity. Markets, organisations and the boundaries of agreement and collectivity shift. This is both because of decision-making and the agency of producers, but also because of the changing strength, duration and certainty of their associations with others who are also negotiating uncertainties in shifting institutional fields.¹⁴

Discourses of economic rationalism and the 'commercial' VR world content they are thought to generate, is one way that works such as OSMOSE© and Placeholder are differentiated from firms such as Virtuality®

by those in the industry. Criticisms are common of 'mass produced' content, and the economic discourses on which they rely for their legitimisation. While project-based worlds are therefore similar to the case of Virtuality® in some financial and technical aspects, they are also discursively differentiated by those in the industry with respect to the economic frameworks which organise them.

The OSMOSE© team at Softimage® Inc., for example, draws on discourses about culture and aesthetics, rather than economics, as legitimising criteria for their work. This strategically ignores the commercial basis of special projects such as OSMOSE© and Placeholder. Art and business do meet, however, and the institutional, corporate and entrepreneurial forms of economic financing and production do have their similarities (Kenyon, 1996; Ryan, 1992). Not all critics and commentators think that the meeting of art and business is a positive development. Says Brian D'Amato (1996), speaking of one (1995) show in which OSMOSE© appeared:

Nearly all the work ... is by commercial designers moonlighting as gallery artists, with evidently next-to-zero knowledge of art history. Have the day job artists been scared away from digital media, either by its technical requirements or, more likely, by its hype? For the most part artists are using computers only sparingly in the context of other projects ... Is it just cultural lag? Or have all the really talented people become commercial designers and programmers who are too busy to mix with the art world? (D'Amato, 1996: 36).

OSMOSE©'s status as an art work sits uneasily in conjunction with these other considerations: not that it is inappropriate for 'art' to be produced in commercial contexts. As D'Amato (1996) argues, what is considered 'art' or 'artistic' in the gallery world is not now providing useful or productive foundations for digital mediums, and digital or interactive VR artists might well be more advised to follow the conventions of other 'cultural producers' such as commercial design work. At the same time, however, Davies and Harrison (1997) of OSMOSE subvert this argument in so far as OSMOSE discursively challenges the standardised conventions of some of the most widely practised commercial design — like games design. The discourses about the relationship of 'art' and 'economics' are thereby shifting, and under negotiation in works such as OSMOSE©.

Differences between these research sites are therefore established discursively, but are formulated in conjunction with interrelational, organisational practices — economic, social and cultural. The differences

between the organisational forms of different sites influence the criteria which mark what constitutes a 'workable' technology in those sites.

OSMOSE© therefore receives legitimisation from the organisational support of a corporate firm already well established in different but overlapping industry/ markets from those of Virtuality®. It is positioned as culturally rather than economically rationalised (and has loose financial couplings), and thus has a shifting relationship to entrepreneurial and venture-funded computing industries. Its network of associations is less extensive than those of Virtuality®. This gives the project team at Softimage® Inc. considerably more autonomy and discretionary powers over the product they build than many of those at Virtuality® experience. The very same dynamics, however, render OSMOSE©'s distribution is more precarious.

Garage organisation is very loosely coupled, and its institutional networks are both relatively circumscribed and relatively dispersed in relation to the other cases and amongst members of different collectivities in the industry. Because garage VR is discursively legitimated as *community* collectivity rather than coupled consistently with particular objects, relevant groups (and their objects) tend to be numerous, malleable and shifting rather than ongoing over time.

Organisational associations therefore come to be part of the product in quite fundamental ways, and have a significant effect on the techno-cultural objects produced in the process. The characteristics that are built into the object preclude other potential developments, and thus set certain constraints on the technological elements of the system. Such characteristics establish parameters, sometimes physical, sometimes conceptual, on what the machines *are* for the people who eventually use them.

The qualities of the object the engineers, designers and entrepreneurs are building therefore need to take on some of the qualities that they assume, or know from previous experience, will be desirable for those purchasing the material systems and/ or the experiences they generate. Templates of and theories about human behaviours and attributes with respect to technologies are considered when the system is designed. Moreover, these 'others' who are assumed, ostensibly 'outside' the organisation, must be persuaded to lend their support.

The Boundaries of Firms: Markets and Positioning

‘Once you have the technology, you then have to mass produce and market it. Chips can be very cheap, but only if you make them in vast quantities. Hundreds of thousands rather than a few hundred. Now its a big risk for anyone to tool up a factory to make that many chips when there is no market yet. But until that happens, the prices of the chips will remain high because of the low production run. The same applies to other part of the system, the headsets and so on. And with high prices, you can’t increase demand’.

Michael Ridpath *Trading Reality*

Scene:

An entertainment trade show hall, the ceiling of the hangar-like building soaring above. The space was filled with the murmured roar of a hundred, hundred people, building overlapping circles of movement as they sampled the digital wares. The spirals of motion would eddy now and then as individual notes in the flow broke off to connect with another they knew.

This happened so often that the interruptions were indiscernable from the pattern itself.

Quite suddenly, I got an elbow in the ribs.

The man I was with had left off talking to his friend from a competitor’s company, and nodded my gaze towards the entrance to the hall. An impeccably presented man had entered quietly, his finely tailored suit in sharp contrast to the t-shirts, jeans, and occasional toga-and-water-pistol guise of many of the hall’s inhabitants.

With him was a woman whose aspect was, frankly, indescribable.

‘I wonder what *family* he’s from,’ my friend remarked to no one in particular, with what I thought was quite unnecessary emphasis.

The question was, of course, rhetorical.

So far, I have talked about the ways ‘producers’ organise themselves into collectivities which shape virtual reality technologies in various directions. I have argued that the uncertainties faced by different organisations produce different objects. Such organisational differences can be understood in terms of how power is circulated and exchanged through financial, human, social and cultural fields of ‘capital’, as well as technical networks. What is the role of the organisations’ ‘others’ in this process? How do ‘producers’ interface, through their objects, with distributors and consumers? What role do distributors and consumers have to play in shaping the VR system as it is produced? What *negotiation processes* (Rammert, 1997) take place between sites?

I want to focus here on the notion of ‘markets’, and how market networks highlight the circulation and exchange of identities and power in the production of VR systems. According to Balsamo (1996: 121), ‘[m]embers of the Cyberpunk subculture — who are also the designers, programmers and technicians — seem to take for granted the economic imperative to create a market for their products.’ The circulation of *identity* in ‘markets’ comes into

play where VR producers 'meet' their consumers at what Cowan (1987) calls the 'consumption junction.'¹⁵ At this junction, 'markets' are assumed to be comprised of particular bodies to which particular identities are assumed or attributed. These producer and consumer identities are important because they come to constitute operational knowledges in artefact construction.

Callon (1987) argues that markets entail the complex circulation not only of economic exchange, but also the circulation and exchange of technical objects, cultural categories of understanding, and identities. Markets can therefore be understood as relationships of exchange and circulation amongst actors or entities.¹⁶ Technical, textual, human and economic intermediaries define relationships between actors in a network.

Those who create VR construct narratives about the market relationships of which they are a part, which characterise the identities of the actors involved. Producers of VR systems draw on a number of discursive frameworks and organisational relationships to characterise their 'audiences', 'users' or 'markets'. These frameworks are both a means of organising production, and attempts to decrease the uncertainties associated with market instabilities and audience behaviour.

Identities are negotiated by those who make VR technologies in conjunction with a number of groups (Miles, Cawson and Haddon, 1992). Most immediately, producers construct market identities for operators/distributors (their immediate customers), as well as end 'users'. There are a number of other 'markets', however, including other specialists in subcontracting firms, or other peer organisations amongst whom the circulation of power, identity and capital(s) takes place. Those who make the technologies are some of VR systems' largest and most consistent users. This produces potentially multiple and competing identities for actors, and contradictions in the ways market relations are managed.

So how do producers construct their relations with others in their technical networks? What identities and practices are entailed in market relationships that are built into the system?

Pre-existing wants or needs for technological commodities such as those built by Virtuality® do not exist. As Ridpath (1996) suggests in *Trading Reality* above, markets must be explicitly created. The development of the VR technology which W. Industries was later to sell was, from the very beginning, organised around how the intended product could be exploited in the field of entertainment. According to Jon Waldern, 'the first big market was, and still is ... entertainment, then as the equipment gets better it will go

into a variety of other areas' (Interview, Palo Alto, June 1996). While the specific technical system frames potential markets, the 'market' is also influencing the shape of the technology.

It is in the discourses of 'marketing' that one can identify the desirable audience qualities imagined by technical and design experts. Market positioning establishes physical and conceptual constraints which preclude other potential development directions. As an example, there is a certain level of 'interactivity', as well as time constraints, programmed into Virtuality®'s games (see Chapter Four). This means that participants do not have unlimited freedom to explore the digital spaces. While some constraints on interactivity involve the technical limitations of processing power, such limitations equally arise from the perceived need of location-based entertainment (LBE) centres to 'maximise' their 'throughput' (Virtuality, 1993). Alternatively, consider how the desires of LBE ownership/ management coincide with concepts such as 'ergonomic design'. If one can simplify the controls of VR systems, for example, one can claim that it is ergonomic because the design promotes ease of use. What is usually not highlighted is the way that ease of use also ensures that customers can operate some of the machine functions themselves, thus saving money for the LBE centre in staff time and involvement.¹⁷ Virtuality® need a discursive strategy which convinces distributors why the Virtuality® product embodies the characteristics Virtuality® themselves imagine are desirable for those distributors.

As they manufacture, the qualities of Virtuality® systems need to take on some of the qualities that they assume, or know from previous experience, will be desirable for those purchasing the units to place in entertainment centres. One market for Virtuality® products are their 'users' (Woolgar, 1991). Virtuality® attribute their users a range of tastes, thoughts and behaviours formulated through 'trial and error', and an accumulated history of social and economic relations in computing and entertainment industries. Those who produce virtual systems need to imagine — construct, define and attribute qualities to — their markets on an ongoing basis, to frame the parameters of what the virtual technologies and experiences will be. The characteristics attributed by producers to users are as 'generalised others.' Abstracted identities of 'audience'/ 'user' are constructed in the process of design (see Chapter Eight).

Those who produce VR systems can assume already existing and multiple publics for various cultural industries, and can work with existing

assumptions about such publics. In these assumptions, identities tend to be abstract and general:

[O]ne of the biggest problems that you face is that ninety-nine point nine percent of the world's population that are going to try these things ... If they're given too much to play with, they're going to get confused. It's like y' know sucking a baby out of the womb and saying go have a great time now and putting it in Disneyland or something — they don't even know how to walk yet (Martin, Interview, Palo Alto, 1996).

Leaving aside the politics of characterising birth as a 'sucking out' (see Figs. 7-2 and 7-3 for birthing imagery in VR),¹⁸ this metaphor is used here to position an imaginary group of users — an undifferentiated 'population' — as inexpert, thus differentiated from the 'experts' within the organisation.

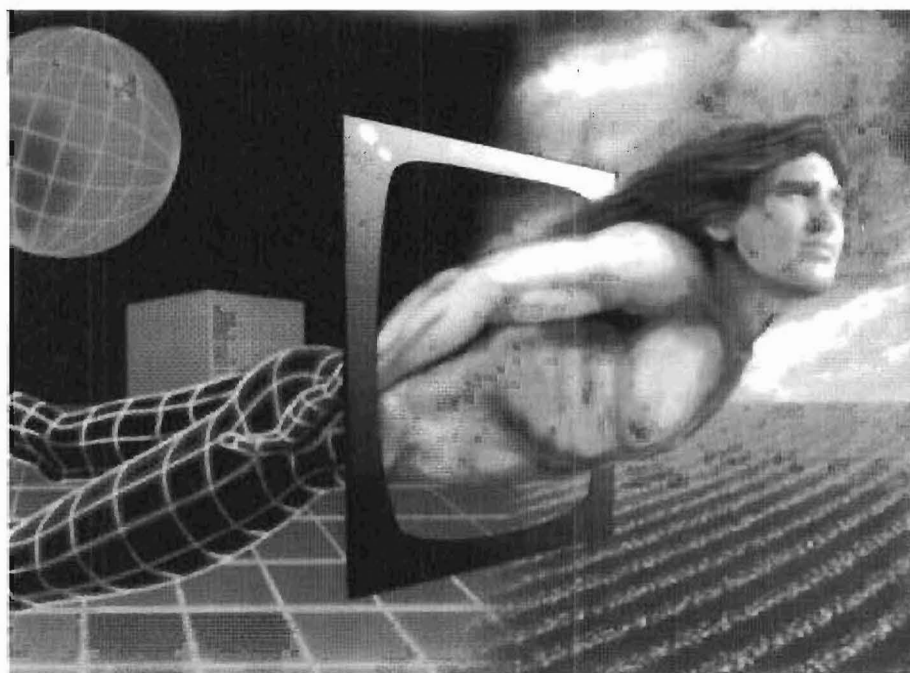


Fig. 7-2
The worlds birthed by the
Western Master subject
*Mondo 2000: User's Guide
to the New Edge* (1992) p. 79
© Mondo2000

This theme recurs: Jon Waldern claimed that it was impossible to explain virtual reality to someone who hadn't 'experienced' it — 'they think they can imagine it, but they don't get the true effect' (Interview, Palo Alto, 1996). Especially in game design, he argues that '... you have an awesome effect,

and trying to convey that to an ordinary public is absolutely ... forget it' (Interview, Palo Alto, 1996). The 'ordinary public' is not only inexperienced, but also unimaginative if they don't agree with or participate in the company's definition of the experience as pleasurable.

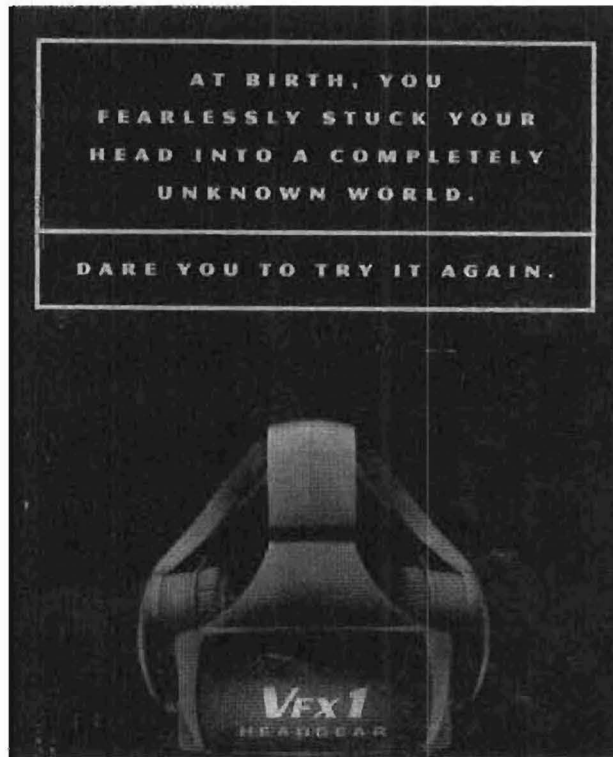


Fig. 7-3
Birth as wilful action
Cyberedge Journal (1996) p. 32
© Cyberedge Journal

At the same time those same managers emphasise that Virtuality® machines have educational value (in so far as they are educating 'people' on the desirability of new computer technologies), and that in this context, '[p]eople aren't stupid. Actually people are very intelligent ... They can follow threads and reason logic, providing its done in such a way as to be insightful and educational. People are naturally attracted to education ... genetically encoded, I'd say' (Jon Waldern, Interview, Palo Alto, June 1996). 'The public' is also 'curious.' Martin maintains that '[e]verybody wants to try virtual reality ... I'm convinced of that. With the exception of a few grandmothers and stuff. You only have to get the actual application that appeals to them' (Interview, Palo Alto, September 1996).

Users for Virtuality® products are relatively undifferentiated by the company, except for ‘a few grandmothers’, who are specifically excluded. This lack of differentiation is, however, gendered. ‘The public’ is generally assumed to be masculine (in contrast to the grandmothers, who ‘don’t want’ to play). Unreflective assumptions about, for example, the roles of men and women in relation to specific applications were evident across numerous sites. In my conversations with those at Virtuality®, as well as many others within VR industries and communities, users, ‘intermediaries’/ distributors and producers were almost universally referred to as ‘he’.¹⁹

‘Users’ are therefore positioned in *contradictory* ways by producers, and the characterisation of publics or audiences shifts with the context. In one situation, ‘publics’ are considered unimaginative and destructive, in another ‘they’ are excited by the company’s vision of virtual reality and desire to learn about it. Because of this lack of differentiation ‘[y]ou can never predict ... what is going to be successful at the end of the day. What people are going to like. Because you can’t predict people’ (Martin, Interview, Palo Alto, September 1996).

The fundamental uncertainty in the circulation and exchange of identities, of money and of meanings, prompts Virtuality® to shape their machines in such a way as to reduce their risks in production. Those in Virtuality® can never be sure that any of their assumptions or assessments about ‘users’ are ‘correct’, so some attempt is made to scientifically rationalise their social theories through the design of the artefact itself. When building their systems, Virtuality® insert AI (artificial intelligence) coding — ‘software tracers’ — in their worlds to monitor the actions of participants. This is to ‘find where people are having difficulty, we can check the stop points, we can even measure history of enjoyment. We design the software so that we get an even peak and trough flow’ (Jon Waldern, Interview, Palo Alto, September 1996).²⁰ These measurements are standardised and averaged across a number of experiences, so that the characterisations of ‘people’ and their actions remain generalised abstractions which become ‘built into’ the machines in production processes. As men tend to play these games far more than women (Hayles, 1996), just as they do video games generally (Shuker, 1995; Provenzo, 1991), those abstractions are based on the game play of this primary group, thus forming a gendered, circular and self-fulfilling prophecy regarding ‘what ‘the public’ want.’ This results in a conservatism, and a recourse to rhetorics of economic determinism. This is acknowledged by those in the firm:

I mean anything potentially could work but you only have so many resource dollars to spend on it and so there is a tendency as well — and some of the titles, well, one of the titles that we've done, is to go for a safe bet so we're doing another 'shoot-em-up' now. And that's pretty disappointing really to have to do a 'shoot-em-up' title, but there's a far more greater risk in a sports title than there is in a shoot-em-up title (Interview, Palo Alto, September 1996).

I want to expand specifically on the politics of VR technology design in Chapter Eight. What I want to note here is the ways that abstract principles stand as models for 'users' in Virtuality®'s interactions with (and assumptions about) its *'real'* markets — the operators who buy the systems, with whom they are sharing local and concrete interactions.

Managers in Virtuality® characterise 'their' operators/ distributors by deploying economic narratives which emerge in their efforts to 'enrol' operators in support of their socio-technical network. Virtuality® uses a discourse of rational economics (the 'return on investment model') to persuade operators that their interests coincide with those of Virtuality®, and that Virtuality®'s objects 'stand in' for rational economic exchange and return on investment.

We [get] feedback from our operators. The fact that they want to see an increase in their return on investment. They want to be able to make money faster on it ... And in order to make very fast money ... [y]es, the product has to be extremely attractive. Yes, you must make people want to play it ... [F]or... the operators, it's important to get [the customers] in out, in out, in out ... (Martin, Interview, Palo Alto, September 1996).

Here, the operators are allies of Virtuality®, working in partnership with a rational return on investment economic model, against an irrational public, a strategy designed to ensure profit maximisation for all parties concerned. Operators are 'businesspeople', who share both a vision of virtual reality as a technical and cultural imperative, and who also appreciate the economic potential of Virtuality®'s systems as economic 'products'. This is in contrast to 'users' who are characterised mainly through discourses of experience and pleasure. As the ongoing result of concrete interpersonal relationships then, the characterisation Virtuality® have of 'their' operators is less abstracted, more complex and differentiated, than the characteristics they attribute to users:

Well it's a volatile market and the market has several stages ... The early adopt ... entrepreneur stage where people will see this is virtual reality this is hot property ... That's in the nature of these people ... spin it off ... But all the time

as you get more ... public awareness of virtual reality, then you have to make the business model more efficient because you're relying less and less on the attraction value and more of the repeat play value ... The long-term players in the industry ... continue to really know ... [i]t's business. They will invest their money in whatever they see could be giving them a good return ... And they're the people that we really have to play to — they're the important people ... (Martin, Interview, Palo Alto, September 1996).

In attempting to form relations of mutual interest, management, marketing and sales sections in Virtuality® attempt to reach agreement with LBE operators about the characteristics of 'users.' Strategies to 'manage' consumer behaviour must be agreed between Virtuality® and operators to intervene in and change the behaviour of users through the shape of the artefact. This simultaneously entails reaching agreement about the specific technical form of the machine, and also entails collaborative strategies to discipline users and position them as consumers in entertainment sites. As Martin notes, the form the VR system takes is directly negotiated between Virtuality® and its operators.

[We're] meeting with ... three distributors in Dallas to show them [a system]. [We ask them] ... can we do this or we can do this? If we did this, how many would you sell? How many would you buy? ... If it was two thousand dollars cheaper, how many would you buy? Try to get feedback from them and a commitment from them, (a) to own part of the decision-making process and to get some ownership and (b) to sensibly try to predict the market (Martin, Interview, Palo Alto, September 1996).

Enrolment therefore takes place at the level of the machine, as operators are invited to make a commitment to and investment in the processes of building the machine itself. Because operators are characterised as having similar interests to those of Virtuality®, they are included in the process of creating the technical artefact, in ways that 'users' are not.

The project of 'enrolment' is also conducted through textual means, in direct advertising to operators. Virtuality® cannot necessarily assume that the characteristics they have attributed operators are any more stable than those they attribute to users. Part of an initial enrolment of operators is to send them promotional/ advertising materials such as magazines which promote the machine, but which also outline the management of user behaviours (see Chapter Six).

The boundaries of the organisation effectively expand through this enrolment of 'others.' Virtuality®'s operators are drawn into the network embodied by their VR system. What is being (provisionally) defined by

producers in these relationships is who is 'technically minded' and who isn't, who has business sense and who doesn't, who has vision, and who doesn't. The shape of Virtuality®'s objects depend both on the identity attributions they make of users, and their ongoing relations with operators. In both cases however, the company remains the central and expert community for defining technical objects, by assuming that non-expert markets need to be fitted to VR systems (see Chapter Four). By contrast, while 'art framed' projects share this construction of 'expertise', they do not share Virtuality®'s strategies towards market formation around a dominant and rationalised economic model. Like Virtuality®, these projects have multiple markets to establish and maintain; both the institution of the gallery or museum, and their potential 'end users'. They are different, however, in the assumptions about the characteristics of those groups and markets.

As we saw in Section Three, whereas Virtuality® positions itself very firmly in the 'commercial' sector, these latter projects position themselves in/ as long term cultural and economic networks, and their objects embody strategies consistent with such a positioning. Galleries and museums constitute an ongoing market for 'high' culture (and thus a site for its construction). These sites value particular institutionalised symbolic systems. On such a basis their management make particular assumptions about the role of publics ('users') in those sites. To reiterate briefly, the history of criticism, 'taste' and distinction, in gallery and museum communities (historically instituted to discern the appeal of a work to particular publics), produces a notion of discerning and critical audiences. Those who create OSMOSE© must convince the galleries that their cultural product is sufficiently embedded in both familiar and new 'genre cultures' (Negus, 1998). The galleries must agree with their definitions of potential audiences for the work, and thus of the aesthetic and critical value of the work defined through those audiences (see Barry, 1996; Graham, 1996).

As we saw in earlier sections, those who produce OSMOSE© position the technology as an expressive and symbolic medium which prompts a transformation of human selves. OSMOSE© employs a rhetoric of an aesthetic, a 'sensibility' (which the artist argues is undifferentiated by gender, but connected to emotion and spirituality) to characterise its actual and potential participants. Unlike Virtuality®, OSMOSE© (and Placeholder) rest on the assumption that when participants invest themselves in the world, it is the inner world of the participants that is transformed via the machine, rather than an outer object world that defines their experiences. As such, the

OSMOSE© and Placeholder project teams recognise the value of the cultural capital of the project with respect to the cultural capital of their audiences (Hesmondhalgh, 1998). The cultural capital of the project is potentially undermined by association with the commercialism of a 'return on investment' model (see following section on 'strategic alliances').

Partial enrolment to market networks is always the case, however. 'Markets' continually shift and remain uncertain: therefore, so does the commercial and cultural viability of a technical commodity. Jon Waldern says of Virtuality®'s 'public space' machines:

Our machines ... still are very expensive, prohibitively expensive for most of the entertainment market. They retail for about thirty thousand dollars, and its not until you get machines down to twenty or maybe fifteen thousand dollars that you really start to ratchet up in terms of volume sales ... (Interview, Palo Alto, June 1996).

Assumptions about markets are revised in concrete interactions between organisations and their audiences. Virtuality®'s operators are only partially enrolled when they disagree with Virtuality®'s definition of LBE systems as 'economically durable' – and don't 'buy'.

Martin talks about how Virtuality®'s technologies shift as their markets shift and change.

[W]hat new models can we use for location-based virtual reality. Should we just be restricted to game playing entertainment in that traditional market or can we take our technologies and apply it to new areas in public space entertainment. Public space ... is information, marketing, retail sport and we're investigating building a network system whereby you have a whole bunch of different location-based VR pods which are all linked to a central experience server if you like. And that experience, you want entertainment, you want information, you want education, shopping — there's a whole bunch of different things that we can find. So I'm really trying to look at all of that, and to see where we're going, where should we be, cause there's a vast array of opportunities, where should we be focusing our resources right now (Interview, Palo Alto, September 1996).

Given the constraints posed by a location-based entertainment model Virtuality®'s inability to enrol operators in their definitions of both the economic and cultural aspects of their systems prompts alternative market strategies. The sometimes contradictory pressures in stabilising objects can shift markets, and in Virtuality®'s case, this would be from LBE into home consumer markets.²¹

According to Martin, Virtuality® could produce

[t]he best VR experience you've ever had in your life — but it'll cost you a million dollars, and you'd have to charge somebody a hundred dollars for three minutes to get anything like a return on your investment for it. It wouldn't work. It wouldn't fly ... If you get in the home, then yeah, you can do it. You spend a million dollars on a home title ... the chances of you selling and recuperating your investment, is far greater (Interview, Palo Alto, September 1996).

These different and shifting definitions of an audience's attributes produces sometimes unexpected alignments amongst different people and projects in the VR industry. The assumption that VR entails a transformation of self for the user, for example, is shared by institutionalised artworks such as OSMOSE©, but also by 'garage VR' practitioners. This group assume and create 'markets', but their organisation differs radically from both from institutionalised art (networks organised around art that are relatively enduring across time), and from commercial enterprises.

'Garage', community or interest VR builders create their own products from off the shelf components (or literally build their own peripherals, as will be seen in Chapter Eight), and in doing so assume 'markets' — primarily themselves, friends, family, and interpersonal contacts interested in VR.²² Those in their interpersonal networks are the focus of their 'marketing', and although not devoid of economic narrative, the creation of 'markets' is a matter of cultural and technical participation in communities of interest and practice 'outside' formal organisations.

In domestic systems networked through Internet, Usenet and the World Wide Web, the assumption is that 'users' — each other — will create technologies to their own specifications from available tools, creating not only their worlds but the means of making them. These technologies are under the direct 'control' (or at least direct manipulation) of the individual user. By marketing to each other, contradictory identities of *both* producer *and* consumer are created which move across other industry sites and relations.

In all the sites, one of the central markets is comprised of 'familiar', rather than 'generalised' others. Some of the most specific 'others' who are markets for technologies are the communities of practice (Constant: 1987: 224) and interest within VR industries. As Rammert (1997: 183) notes of technology production,

Negotiation processes take place within organizations between representatives of different social worlds. Roles and programmes concerning design,

implementation and use of new technologies are negotiated between professional groups ...

Those at Softimage® Inc. articulate this most clearly as a goal for OSMOSE© when Davies and Harrison (1997) imply a technical audience for the work. She notes that '[o]ne of the primary goals of OSMOSE© was to push the expressive capabilities of existing 3D tools, to demonstrate that an alternative aesthetic and interactive sensibility is possible for real-time, interactive, 3D computer graphics.'

In 'garage' VR and OSMOSE©, in Virtuality® and in Placeholder, production and consumption meet most closely in the bodies of the technologists themselves. In Fig. 7-4, the audio programmer who worked on OSMOSE© also works on Placeholder, and participates in the world.

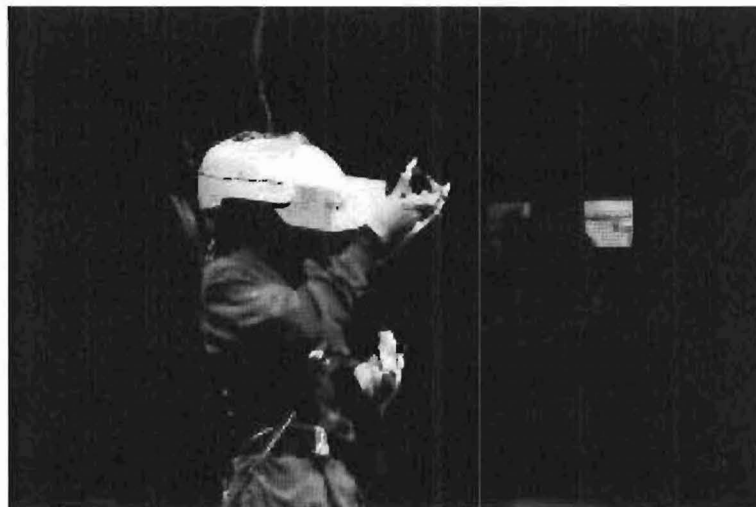


Fig. 7-4
Dorota Blaszcak
Audio Programmer for OSMOSE© and Placeholder
[http:// www. interval. com/
projects/ placeholder](http://www.interval.com/projects/placeholder)
© Interval Research Corporation

These are specialist or expert markets, which simultaneously form the communities of interest and practice that materially construct VR systems. As Saxenian (1995) notes, industry conferences, special interest groups and trade shows provide forums for constructing communities of interest, who are also audiences for showcase products. Martin characterised this audience for their demo at SIGGRAPH:²³

We had such a cynical audience. They were a very educated audience so they were used to searching out what is the newest, best, greatest ... [A]nd you

expect them not to be amazed by anything in many respects. But yet the people that came on our stand were highly intelligent people with a very good understanding of technology ... And yet going in there — [they were saying] ‘Wow! This is it,’ y’know, and probably less concerned about the technology because those that work technology have a good understanding of how it was done before, what was the effect of it ... (Martin, Interview, Palo Alto, September 1996).

This dual and ambiguous positioning of designers and engineers as both producers and consumers has two effects. On the one hand, producers can identify as users. In this case, they can argue that they design from the personal and experiential resources available to the position of ‘user’. This can mean, however, that because they are ‘users’, their experience is universalised to those of all potential users. The following scene from ‘Trading Reality’ imagines whose those universal identities might be (1996: 102-103):

Software turned out to be a room about half the size of the production floor, but it looked very different. There were about fifteen smooth black desks, each manned by a programmer with his computer ... a group at one end of the room ... were laughing loudly as they tried to hit a cup, perched on a filing cabinet, with a frisbee...

One of them saw my suit and the game stopped.

I looked around the room. I suppose I’d expected rows of regulation nerds, stunted twenty-two-year-olds with acne, glasses and greasy hair. Well, there were some of these, but what struck me was the diversity of people. Most were in their twenties, but there were a couple of schoolmasterly types in their forties. There were two or three Asians. Some wore T-shirts and jeans, but others wore ties and hung jackets on the backs of their chairs. There were no women.

Chapter Eight takes up the implications of these identifications for the process of technical design.

The gendering of a universalised experience for ‘users’ in this context is built on the figure of the western ‘Master Subject’ (the white heterosexual, middle class man (Haraway, 1991)), who orders knowledge of world, ‘self’ and ‘other’ in opposing, and unequal binaries of difference. Those who invest in this identification have, until the last decade, had almost exclusive access to ‘computing’ knowledges.²⁴ According to Brenda Laurel (McCarthy, 1993), human interfaces are presently grounded in sets of cognitive abilities and learned skills that reflect the worlds of only a few, predominantly masculine subjects. The interfaces use metaphors which empower those who have these skills, and disempower others. Technical decisions are made not only on the basis of perceived characteristics of markets and the formulae of culture industries, but also on the basis that the software developers themselves are

game players. As such, they occupy potentially multiple positions, yet assuming the formula, those that they enjoy, is the most appropriate for all publics. It is this dynamic in computing industries more generally that prompts Frank Rose (1989: 38) to claim, of Apple® Computers, that

People ... focused their attention inward — on their leaders, on their myth, on their technology on everything except their customers. Though they talked a lot about being a “market driven” company, what really drove them wasn’t the marketplace but technology. The world outside couldn’t compete with the ideas of their own engineers.

In conclusion, the ways that some actors and entities (whether this is an individual like Char Davies or a collective such as Virtuality®) talk about their ‘markets’ and build market relationships is that in doing so they create boundaries — between bodies, between identity categories, between the inside and the outside of organisations, skills, and politics. They thus legitimise, by virtue of durable collective practice and standards, who can articulate what it means to be virtual and who cannot, who has a voice in what virtual identities might relationally mean, and who does not.

Whereas some assume that VR producer individuals and organisations work with monolithic assumptions about their audiences, what emerges is a complex and contradictory field of economic, social and cultural identity exchanges which shift over time and across material contexts. This is consistent with Beirne, Ramsay and Panteli (1998: 145) claim that ‘users’ are constituted and can be differentiated in at least six different categories:

(1) the patron, initiator and champion of the system, (2) the client, for whom the output is intended and who will pay the bills, (3) design interactors, that is, people involved in system specification and design, (4) end-users — the individuals who will operate the installed system, (5) those involved in maintenance and enhancement of the system and, (6) secondary users, including people displaced by the new system, people whose work is changed by the system, those whose non-work life is affected ...

The work of identity circulation links the work of managers, designers, engineers, programmers and publicists, with that of the consumers of such cultural goods - the distributors and users.

Across different sites, a range of relationships — both collaborative and competitive — amongst producers and consumers, emerge. How this is played out in strategic alliances amongst actors in a global organisational field is the subject of the following section.

Strategic Alliances, Competition and Collaboration

'Project Platform is the code-name for the alliance between us, Jenson and Microsoft. Our system will be bundled up with every copy of Windows sold. If anyone wants to use a VR application under Windows they'll have to use FairSystems' simulation management software, and the FairRender graphics system. And it will be right there, on everyone's computer, just waiting for them to try out ... This is a revolution in computer technology that is about to happen, almost as great as when IBM introduced the PC in 1981.'

'You're right. And we're ...'

'Microsoft' ...

I saw the weedy image of Bill Gates ... In less than fifteen years, Microsoft had grown from nothing to be worth more even than the mighty IBM. And the reason was that the Microsoft operating system had become the standard ... In the new world of mass-market virtual reality FairSystems would own the standard operating software ... Richard had been right all along. He was on the brink of building a company that would change the world.

Michael Ridpath *Trading Reality*

In the above scene from *Trading Reality*, management and engineers in 'FairSystems' seek to position their technology as an 'obligatory passage point' for virtual systems use (Latour, 1987: 150), thus establishing a durable new set of socio-technical relations in virtual reality production and use. This (fictional) description of an alliance between three companies highlights the ways that strategic alliances directly shape the form of technical systems. It also describes the 'dream' of many small entrepreneurial VR firms: to develop the standard product for ubiquitous computing systems.

In the economic discourses of capitalism, corporate bodies organise the economic system through market conditions: through the endless circulation of supply and demand in a competitive environment, which operate under conditions of 'perfect' competition. Such competition can have both intended and unintended consequences. As Rammert (1997: 183) notes, corporate bodies make alliances amongst themselves with an eye to competition:

Bargaining process take place in more visible conflict arenas between competing organizations. They result in overt or covert compromises redefining the original project's purposes and sometimes distorting them into techno-structures that none of the participating actors had intended ...

It has long been recognised however, that economic exchange in markets is not necessarily 'competitive'. To the contrary, 'producers' of different kinds and capacities collaborate in a number of different ways, including a variety of licensing, distribution, ownership and financing partnerships. One means

of creating allies is through organisational strategies such as franchising (see Fig. 7-5 for Franchise advertising).

In *Left To His Own Devices* (Gentle, 1994: 36), one paragraph of text graphically depicts patent and copyright struggles which brand technical systems. One means of establishing control over the use of technical systems is just such ('ShakespeareWorld') franchising deals.

As he pulled the goggles over his eyes, he saw her have the grace to give him her own most self-mocking smile.

VR space.

A pale light glows in the depths, grey and glittery, with a hint of wings ...

The glittering greyness becomes a room with white walls and a low, beamed ceiling. The boards are bare. Men in stockinged feet move about the floor. They are men in ruffs. Doublets and knee breeches, practising swordplay ...

Red letters run across the top of his vision, exactly where (he notes wryly) a military HUD would run. ALL THE WORLDS A STAGE™ *A ShakespeareWorld Franchise Production*. It blips out before company and copyright details appear: Obviously not pasted in yet.

Franchising has played an important part to date in the development of virtual reality technologies in the entertainment industry.



Fig. 7-5
Cybermind Operator/ Franchise Advertising
© Cybermind

The 'Cybermind' entertainment sites franchised a chain of stores (see Fig. 7-5) organised around a 'concept' for a Disneyland-like virtual entertainment

venture (see Chapter Five). These relied heavily on Virtuality® and Virtual Worlds Entertainment 'Virtual Geographic League' units (see note 15, Chapter Four) (see Fig. 7-6 for Virtual Worlds Entertainment advertising).

Another means to establish organisational alliances is through enmeshing a number of different firms in intricate webs of financing and licensing deals. Firms and their products are often established and renegotiated through the ongoing repositioning of financial alliances, and the management of (often venture) capital (Coser, Kaushin and Powell, 1982). When Virtuality® 'starts up' as W. Industries, they draw on established protocols and business relationships to enrol the financial capital of other companies for ongoing product development, until durable associations are made.

Virtuality®'s emerging entrepreneurial identity can be inserted in already existing sets of economic and political networks. By 1994/5, for example, Virtuality® had entered into capital venture and financing relationships with IBM, Phillips, and Motorola — all giants in the computing, electronics and communications industries — and with Kawasaki, a multinational corporate whose interest was in simulation technologies for vehicle testing.²⁵



Fig. 7-6
Virtual Worlds Entertainment Advertising
Courtesy of Virtual Worlds Entertainment

This capital provided the impetus for Virtuality®'s growth, and it geographically expanded its reach into 33 different countries. Jon Waldern describes this growth process:

I used to run the company ... pretty much singlehandedly until last year [1995] ... If you look at the technology ... [t]he second generation is sort of where we are now ... and I've designed third generation, which is pretty awesome, and pretty much what I've always wanted to achieve which is to do VR properly, and that has been done ... There's some pretty revolutionary technology involved in it. The problem is that running a company, you can't do both. ... I switched my position from Chief Executive in January [1996] to Chief Technology Officer ... So this is our new research centre ... and basically the purpose of the centre is to recruit the necessary people, to build on already existing relationships that we have, and to bring through third generation. Which is the gloves (Interview, Palo Alto, June 1996).

Each element of these processes has required Virtuality® to negotiate its entry into new relationships in different kinds of political, geographical and organisational systems, including stock markets, national and international distribution and support networks, and, for example, politically defined standards of health and safety. All of these negotiated relationships entail some degree of change in other parts of the socio-technical network which is Virtuality®. Martin argues that 'commercial feasibility', defined via revenue, is the 'bottom line' for organising and evaluating such changes:

I've worked very closely with our finance director ... but really to look at resource allocation, the impact [of] other projects on the revenues of the Company, positive or negatively. That will be ... the final say will be with Finance ... I mean that's the right way to do it as well (Interview, Palo Alto, September 1996).

In the process of technical development, the organisation of capital in commercial entertainment ventures shifts from small scale entrepreneurial and venture capital — a form of organisation which is 'risky' — to wider networks of corporate capital. In this way its organisation is similar to biotechnology firms (Barley, Freeman and Hybels, 1992) or the dance music industry (Hesmondhalgh, 1998).

OSMOSE®, by contrast, is *already* embedded in the corporate organisation of Softimage® Inc. OSMOSE®, no doubt, would not — could not — have been produced without corporate support. One cynical critic pointed out that some of techno-artists' fascination with reflection on nature is a result of 'misplaced guilt over access to extremely costly methods of production' (Lunenfeld, 1996). Furthermore, the development of those methods of production relies on the ongoing support of the company who in 1994 bought Softimage® Inc. — Microsoft®. The politics of naming the relationship between Softimage® Inc. and Microsoft® was still being

negotiated in 1996. Officially, the 1997 Softimage® Inc. webpage says itself and Microsoft® ‘merged’ - and underline the fact that the company is a wholly owned subsidiary of Microsoft®. The official blurb on Softimage® Inc.’s web-page ([http:// www. softimage. com/ about/ backgrounder_ MS. htm](http://www.softimage.com/about/backgrounder_MS.htm)) talk about the mutual advantages of such a merger:

Softimage is an essential part of Microsoft’s efforts in the multimedia and digital video markets. Leveraging its expertise in 3D animation, Softimage has helped provide key technologies and specifications to programs such as Direct 3D, Microsoft’s 3D rendering application programming interface (API) and Direct Show, Microsoft’s client video streaming technology ... Softimage maintains a tight link with the Microsoft Research group by incorporating the software, ideas and concepts of some of the most highly regarded researchers in the computer graphics field into its future product versions.

To my amazement, while downloading corporate background information off Softimage® Inc.’s website, using a truly ancient text-based web browser, I came across what I can only assume to be hidden text, of the webmaster’s notes to himself. I have no idea whether it was the webmaster’s (‘Enrico’) mistake, or a technical hitch, or whether the information was supposed to be displayed in the document. The note read:

The goal here is to make it also look like Softimage searched out Microsoft (as the legend reads). Daniel’s vision was to bring high-end 3-D animation to the masses, and Microsoft had the distribution. Should also mention that SI continues to operate as a wholly-owned subsidiary, based in Montreal, Quebec, Canada, rather than a division w/in Microsoft ([http://www. softimage. com/sibackground](http://www.softimage.com/sibackground), 1997).

A number of cultural critics have noted that Microsoft® has become *the* digital culture producer for the end of the millenium.²⁶ While corporations are certainly not singular, they do have hierarchies or organisational mechanisms which produce standard ways of formulating and approaching goals, and organising their activities. And although mass production, standardisation and mass marketed conventions are no doubt subject to appropriation and renegotiation, the multi-national corporate assimilation of smaller firms in VR industries creates contradictions around how those smaller firms are able to operate.

My intention here is not to untangle the no doubt extremely convoluted relationships which constitute extended markets for virtual reality technologies in their myriad forms. I want simply to speculate on how such networks affect oppositional artefacts and discourses, such as those produced

by OSMOSE© (Alexander, 1996). Corporate takeover can bring economic capital and cultural capital into conflict. As Hesmondhalgh (1998: 248) argues in the case of the British dance music industry, '[t]he corporations which dominate the cultural industries have developed an understanding of the economic value of 'credibility', and now have a number of strategies for incorporating [technologies] imbued with it into their organizations.'

But the question must be asked: If large companies own both the conventional and the 'oppositional' then the question becomes — what resistances to corporate definition of desirable worlds are possible? What of the 'Others' that Microsoft (and others) economically and socially create through multinational corporate practices, the human and non-human 'Others' that OSMOSE© claims it speaks to?

The OSMOSE© team employed other organisational strategies, in the form of making informal agreements, to secure alliances for OSMOSE© in the form of technologies. According to Davies, if the hardware can be procured, it is not difficult to exhibit long-term. Procuring the hardware is difficult because OSMOSE© is run on the 'rolls royce' of processors, the Onyx™ graphics generator (see Fig. 7-8), and because this equipment is borrowed and relies on the goodwill of the company which makes it (Silicon Graphics® Ltd.), its not always possible to show OSMOSE© even if installation spaces can be found.

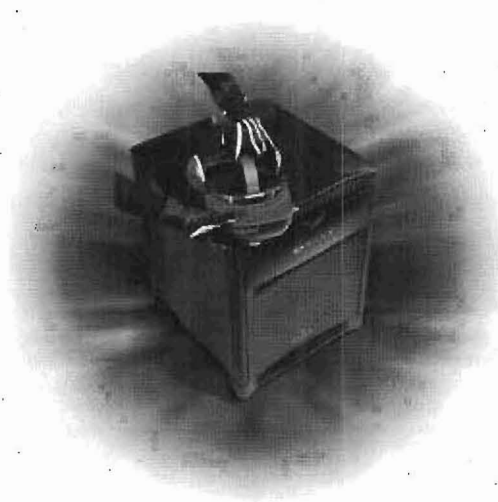


Fig. 7-7
Onyx2 Graphics Generator
© 1998 Silicon Graphics Inc.
Onyx2 Image Provided by Silicon Graphics Inc.
Silicon Graphics is a registered trademark and Onyx2
is a trademark of Silicon Graphics Inc.
Used by Permission

Softimage® Inc. lost two shows of OSMOSE© that had been arranged as they could not get the Onyx™ they needed to show the piece. The graphics generator is fundamental, and those at Softimage® Inc. have sometimes become frustrated with the sometime unwillingness of Silicon Graphics to loan an Onyx™. The use of the Onyx™ is proving a great limitation for exhibiting the work, due to the near impossibility of getting hardware loans. Davies speculates on a number of reasons for this reluctance:

some individuals have been very enthusiastic ... others have been indifferent. It may be political (ie SGI vs Softimage Inc. etc.) or it may be lack of interest in supporting the arts or it may be lack of profit margin to support the arts, or it may be lack of availability of machines to loan at the present time - it may be all of these in combination (Davies, Personal Communication, 1996).

Davies considers SGI the best platform for OSMOSE© because of its facility in doing transparency in real time. Davies feels that its unfortunate that Silicon Graphics doesn't recognize 'how uniquely OSMOSE© shows off the capabilities of SGI hardware - but alas they do not seem to, or else the reasons [discussed earlier] preclude them acting in our favour' (Personal Communication, 1996). The cooperative arrangement *initially* established between the OSMOSE© team and Silicon Graphics is the type of relationship which fosters a VR community, and is the type of relationship which fosters the collective negotiation of standards.

The struggles over standards are expressed in many ways: physically in particular systems/ 'platforms' developed (see Chapter Eight), or legally in the ownership claims/ patent rights for those systems. Technical standards, the struggles over what they should be and ownership of them, describe very well the shifting alliances of the computer industry, an industry renowned for its 'startup' firms, entrepreneurial ethos, and high turnover of both companies and individuals within them (Rogers, 1985).

Ridpath suggests in *Trading Reality* (above) that the struggle to produce technical standards is one of competition strategically enacted with the help of business allies. Equally, however, the negotiation of standards is formulated in community relationships of negotiated agreement, in the form of informal adoption, formal industry adoption and legislation (Saxenian, 1994). When alliances are formed and shift, a field of cooperation amongst competitors, as well as amongst allies, is potentially formed. Saxenian's (1994: 49)

description of standards setting in the semiconductor industry applies equally in the case of a number of virtual reality technologies:

Technical standards are especially important in industries ... that are fragmented and technically complex. [Industry groups] invested considerable effort in building consensus among its members concerning industry technical standards ... [The] process involved the volunteer efforts of [many] industry professionals who defined specifications for virtually all materials, processes, and equipment used ... [T]he process of standards setting was as important as the standards themselves, because it helped build close understandings and working relationships between suppliers and end users.

In my research, I saw this negotiation in operation during a VeRgE (Virtual Reality in Education) meeting where two 'syndicates' were presenting their cases to a public meeting over competing standards for avatars (digital bodies) in shared three dimensional networked worlds.

Competition and cooperation meet when standards are also patented to particular companies, and the intellectual and economic ownership of particular techniques become enshrined in legal discourses. Such legitimisation of corporate alliances 'normalises' the commercial production of virtual reality systems for entertainment, and standardises their production in such a way as to centre in mainstream mass production.

Conclusions

Virtual systems are 'boundary objects' — that is, 'objects which allow members of different groups ... to come together for some common endeavour ... one object is understood on multiple levels by diverse groups and /or individuals ... Multiple readings do not always result in coordination. Contested readings can also occur' (Henderson, 1995: 214).

What this chapter has addressed is how different technologies emerge from different 'modes of coupling'. That is, technical objects such as Virtuality®'s pod or OSMOSE®'s vest differ in their form, function, and symbolic value because the technical systems which they embody differ in the strength, closeness and consistency of interpersonal, organisational and discursive relationships.

Technology studies may analyse the *modes of coupling* between different parts and kinds of the technical system. Which type of coupling assures stability or flexibility ... On the level of organization, research subjects are the design of programmes and the negotiation of rules to couple the human,

physical and symbolic elements in factories, hospitals or nuclear power plants' (Rammert, 1997: 177-178).

Virtuality®'s pod and garage VR's standardised software both embody the forms of organization that produced them: the time limits on Virtuality®'s machines are constraints arising from their economic model, and the efforts to produce software standards across a number of different systems and platforms are moments of negotiation in the spirit of cooperation and community in garage organization. Technologies do not embody their organisations in necessarily straightforward ways, however. They are representative of local moments of struggle: OSMOSE©'s reliance on borrowed hardware as a limitation to the work is a good example. Such moments of struggle occur in response to the changing conditions of competition, alliance, and the uneven growth of capital networks across different fields.

Different objects are produced, and as they are negotiated, the boundaries of what the organisation is, what it produces, and who produces it shift over time. Virtuality®'s markets extend when they enrol their distributors in support of their machine, for example. Different organisations present different ways of establishing, maintaining and legitimising VR production. OSMOSE©'s credibility, gained from cultural capital, draws on different resources than those of Virtuality®, who employ a legitimising strategy embedded in discourses of economic rationalism. Competing definitions of technologies and ways to organise technical production give rise to different organisations (which change over time). Virtuality® shifted from a small entrepreneurial firm funded through venture capital to a corporate, which changed its form as different markets were explored and products developed. The shifting forms of organisations are derived from the workings of familiar industries and embedded in them. At the same time, technologies are the result of organisational negotiation and bargaining amongst collectivities; Softimage® Inc. has obligations to its 'parent' company Microsoft, as well as the shareholders of both companies — publics who participate in the collectivity of the company. There is a politics of possibility in the ways that 'markets' shift, especially when some markets are communities of practitioners, who are working both inside and outside the mainstream, on the margins and borders.

Understanding how technologies are built helps us to understand what some of its productive and discursive contexts are, and therefore how it might

be done differently. The interplay, for example, of economics and politics at the level of industry and public policy-making on technology production and/ or development crucially affects the kinds of technologies that can be both imagined and produced. How these dynamics, alongside organisational struggles, generate discourses of expert/ inexpert, legitimate/ illegitimate, real/ virtual crucially affects the politics of subjectivity which get played out through the machines. The conflation of 'real' with economy/ industry, and expert with skilled masculinity (as Virtuality® tend to do in their rhetoric), influences whose voice is to count in the production of these computing systems, and the politics of subjectivity and embodiment which attend them, at the end of the millenium. Martin argues that the only way for Virtuality® to operate is to ignore difference and diversity in its users, and to mass produce to the 'universal' they imagine in a consumer market:

Yeah, we can't be one size fits all ... there's no one piece of software to virtual reality. However unfortunately ... For us to do that, we would have to create so many different applications that we can't physically support resource-wise (Martin, Interview, Palo Alto, September 1996).

How such models of consumers are 'built into' technical objects, and what socio-technical practices enable the production of different virtual systems, is the subject of the next chapter.

Producing the Virtual:

Artefacts, Design and the Politics of Technics

To ask what is on the other side of the computer screen is ... a crucial step in dissenting from [a] consensual hallucination. Behind the screen of my laptop lie silicon chips, a battery, microprocessors, and even what seem to be a few old-fashioned screws ... My access to the presumptive world behind the screen carries with it an effaced history of labor, of people building machines to design and to build even more sophisticated hardware and software. The imaginary realm of cyberspace — of the reproduction and satisfaction of endless desire — is a fantasy based on the denial of ecology and labour, a dream that is also an apology for the socio-economic power to bring together sophisticated technologies.

Robert Markley *Boundaries: Mathematics, Alienation
and the Metaphysics of Cyberspace*

You decide you want to be a lobster, so you reach behind your left ear, and you pull this lobster out, and you dive into its body ... [H]ow is it that somebody knew you wanted to be a lobster, and what a lobster looked like? You know, all those kinds of problems you could just arm wave?

Sue McCarthy *Brenda Laurel Can Blow Anything Up*

How virtual reality technologies come to take the form they do, and how they are positioned as objects in discourse by those who do the work of building them, remain central questions in the politics of virtual reality technologies: despite

attempts to efface them. As we have seen, virtual systems are 'techniques' which act on and produce bodies, subjects, objects and knowledges (Sawicki, 1991). Just as virtual reality technologies are physical and ideological tools which intervene in the construction of subjectivity, so too are material and subjective positions, resources for the construction of technical objects.

While in previous chapters I have explored the construction of a 'virtual' milieu, in relation to participants, operators, businesses and the relations between them, in this chapter I want to shift the focus to the technologists¹ who build virtual reality technologies, and to the specificities of the objects they build. I want to examine who designs and builds virtual systems, and the technical and cultural discourses (re)produced in the process. I also want to investigate how assumptions about what it means to be virtual, and how that should be achieved, are maintained and reworked through competing versions of technical artefacts and their positioning by technologists. Who are the stakeholders in this process, and what is at stake?

As I began to talk to those engaged in building VR systems in commercial enterprises or at home, my appreciation increased for the diversity of people involved, and the multiple understandings, approaches and practices through which these technologists positioned themselves and their objects in a number of social worlds. This contrasted strongly with some theoretical accounts in which 'technologists' become an abstract category, a category which at once demonised the organisation of technological work (Penley and Ross, 1991), and simultaneously effaced the labour in which technologists were engaged (Markley, 1996). My interest in focusing on VR building practices was also prompted by technologists themselves. On the one hand, some emphasised the fundamental importance of public debate about the technical and social processes/ problems involved in building virtual worlds, as in the case of Brenda Laurel (McCarthy, 1995). On the other hand, some also positioned themselves as 'serious' engineers, asserting the need for recognition of engineering and programming work/ industries in the face of media generated 'hype'.

These accounts seemed to share a central concern with material objects as a fundamental (and at times determining) infrastructure in virtual reality building. The concerns of technologists intersected in this way with my critique of approaches to VR as media, which focussed on the 'content' of virtual worlds at the expense of an analytical focus on the 'context' of virtual reality technologies

— their material form and the social relations which locate them.² My struggles to ask questions about the connections *between* — between production and consumption, between the ‘real’ and the ‘virtual’, between a number of social worlds — seemed an appropriate way to understand how technologists both position, and are positioned by, their objects. Through attention to connections, I seek to understand how relations between technologists and their ‘others’ are formulated, maintained and reworked through the material form of virtual systems.

As a basis for addressing these issues, I have talked to engineers, programmers, artists and hobbyists. Here, I will discuss what they do and how they position themselves in technical and other discourses. In doing so, I want to draw out the similarities and difference amongst the virtual systems they build.³ I want to deconstruct the activities and positions of the technologists I have talked to, and examine the ways that artefacts involve technical, as well as cultural and economic, labour. I want to focus on those aspects of design and production processes that link the enduring material and discursive frameworks of different groups, and offer spaces amenable to change.

This chapter therefore explores how objects are put together, and how, in the process, technologists become both subjects of, and agents for, the technologies and ‘experiences’ they create. The construction of virtual reality technologies as socio-technical networks entails investments in technical skills and knowledges, located in particular organisations, and in discursive frameworks of boundary making. I will use Wiebe Bijker’s (1997) notion of technical ‘frames’ to guide my reading of the connections between various knowledges, practices and sites. My interest is in the identity/ power effects entailed in the discursive and practical conventions of making virtual systems — for technologists, as well as for their ‘others’ — and how the relations between technologists and their others are constructed through the systems built. What VR technologists do, and in what contexts, are therefore central questions which explore how boundaries of difference and similarity, inclusion and exclusion, categories of cultural meaning, are variously ‘built into’ virtual systems as technical objects (Law, 1991a; Star, 1995).

Technical Frames

Langdon Winner (1977, 1986) argues that artefacts have politics, while Bruno Latour maintains that science and technology are politics by other means (1988a). These claims are related to notions of objects/ artefacts as ‘networks’ or ‘ensembles’ of socio-technical practice. Technical design and production are the explicit processes through which technical experts put technologies together, and are also the fields in which struggles over legitimate definitions/ forms of virtual systems as specifically *technical* objects are carried out.⁴ Akrich (1992: 208; see also Callon, 1987: 85) argues that

when technologists define the characteristics of their objects, they necessarily make hypotheses about the entities that make up the world into which the object is to be inserted. Designers thus define actors with specific tastes, competencies, motives, aspirations, political prejudices, and the rest, and they assume that morality, technology, science, and economy will evolve in particular ways. A large part of the work of innovators is that of “*inscribing*” this vision of (or prediction about) the world in the technical content of the new object ... a “script” or a “scenario.”

Whereas participants’ ‘scripts’ about virtual worlds emphasise practices of embodiment and identification, designers and producers generate ‘scripts’ or ‘scenarios’ about realist relations between ‘humans’ and ‘VR systems’. Whereas ‘users’ emphasise the human identities and actions that are available through digital mediation, designers emphasise what the technical qualities are (or should be) to prompt/ generate human action in virtual realities. VR technologists define their work as predominantly ‘real’, whereas the work of participants they characterise as predominantly ‘virtual’ (digital).

Technical practices are political processes, and a range of virtual systems emerge from the convergence and/ or divergence of different technical frameworks. Drawing on actor network theory, and insights from social constructionist approaches, Bijker (1997) proposes that technologists employ ‘technological frames’ when constructing artefacts. Technical frames and configurations are useful to examine the premises, practices and political consequences of socio-technical construction — how an artefact achieves ‘closure’, or ‘stabilisation’: how ‘it’ becomes what ‘it’ is. These frames are comprised of (both existing and changing/ new) knowledge, goals and values — as well as the rules and habits for socio-technical practice. Frames emerge from

interactions amongst individuals and groups in communities of technical practice, and are structured by the collective knowledges and histories embedded in those groups.⁵ These frames are thus an ensemble of knowledge/power practices of meaning-making, and material practices of technical construction, embedded in ways of organising those knowledges and practices.

According to Bijker (1997: 123), a technological frame

is not an individual's characteristic, nor a characteristic of systems or institutions; technological frames are located between actors, not in actors or above actors. A technological frame is built up when interaction 'around' an artefact begins. Existing practice does guide future practice, though without logical determination...

Bijker (1997) suggests a provisional and partial range of relevant elements in the formation of technological frames including: the goals of those who are building artefacts; their key problems; the strategies they use to solve problems; the requirements to be met by problem solutions as well as unintended consequences; both currently held theories and tacit knowledge; testing procedures; and design methods and criteria.⁶ I would add to Bijker's conceptualisation a concern to pay attention to how these frames are discursively produced and mediated, in language, signs and representation, as well as through tacit and explicit bodily practices. Furthermore, individuals may be part of a number of social groups for whom the technology is relevant, and so may draw on multiple frames to structure their interactions and activities.⁷

Considering technology through technical frames is one way to examine relations of power embodied in diverse objects and sites of production, and to connect discursive and practical conventions of object building. It addresses questions of power and multiplicity in political struggles over the meaning of VR, who and what 'it' is built for, and what humans become in relation to 'it' (Haraway, 1997). The technical frameworks employed to build objects — the standards and conventions used in technical development by communities of knowledge, practice and interest — intersect with and reformulate economic, social and cultural fields. Those standards and conventions shift, and are often contradictory, prompting both collaboration and conflict amongst 'expert' communities. The different artefacts that result from these contradictions generate a range of conflicting definitions of what virtual reality is, and the identities that are characterised or created by it.

As has been intimated throughout the thesis so far, the componentry required to put together an immersive virtual reality system consists of the computer which drives the system, peripherals including head mounted displays (consisting of display/ optical devices, position and orientation tracking devices, audio output and (sometimes) input devices, and cabling), or interface devices which provide body position tracking — such as the ‘guns’ of the Virtuality® units or the breathing vest of OSMOSE© — and their processors.⁸ It also requires modelling and world-building software. As is the case with other computer artefacts, VR systems are fairly modular, and may employ a range of processors, peripherals and software that are already stable artefacts, firmly embedded in the economic and social networks of VR industry and community. Hardware development entails acquiring the material resources for constructing computer (and other) componentry, and the organisation of production which transforms these raw materials into physical objects. The ‘hardware’ objects so defined include the componentry of the central processing unit (as well as specialised boards and processors for graphics, audio or tracking processing), signal converters to translate computer signals to video signals in viewing devices, and the peripherals themselves which can be both ‘input’ and ‘output’ devices.

Into this network of hardware, software technologies provide operating instructions. At the ‘lowest’ level is the software for computer function, which enables or commands computation. Over the top of this (sometimes) is operating systems software which runs an interface between people and computer functions. Sometimes there is another level of software over this which runs functional interfaces for those not so interested or competent in the intricacies of manipulating operating systems. These are applications such as Microsoft® Windows™ for PCs, or the GUI (graphical user interface) on Apple® systems. Digital worlds are programmed over the top of whatever preceding layers exist. They are first modelled through software which designs and builds discrete objects with shape, point of view, lighting, texture and sound. Because these objects are modelled as three-dimensional (even if displayed in two dimensional form), they can be viewed from a number of different perspectives, places and distances. The interactive element of the graphics processing, therefore, models 3-D objects from multiple points of view ‘in real time’. Once the models have been created with the visual and auditory characteristics of form, they are programmed with specific ‘behavioural characteristics’ (Jacobson, 1994: 26) —

that is, they can move, change shape, or 'behave' independently of the participant. In both modeling and behavioural programming, it is possible to build programming routines from scratch, but virtual worlds can also be built with pre-packaged modeling and world building software (usually based on previous knowledge of programming languages such as C++), or libraries of virtual objects.

Each element of this milieu must interact with others in particular ways to produce a system, and tradeoffs are made between different technical elements, which produce different effects for how the system works as a whole. In addition, these activities must be coordinated using a number of skills. Not only is engineering required, but also knowledge of manipulating moulded plastics. Not only are computer programming skills required, but also artistic skills for storyboarding worlds. As has been seen in Chapter Seven, this division of labour can be organised in a number of different ways, from a situation in which firms produce a formalised (intra and inter organisational) division of labour, to individuals employing a range of different skills to build a system themselves, or more informal networks in which individuals and groups divide tasks on an ad hoc basis. 'Techno-structures ... emerge as schemata of technical practice and programs of efficiency out of everyday routine actions' (Rammert, 1997: 175).

The technical network required to construct a system such as that described above, and the labour that produces it, are understood in different ways in a range of technical frames. Those who build VR systems occupy a number of social worlds, and draw on a range of sometimes contradictory discursive resources to do their work and understand/ attribute meaning to what they do.⁹ To explore how technical frames provide the parameters for design and production processes, throughout the chapter I will examine some of the possibilities and constraints engendered in virtual systems by those technical trade-off decisions. I want to move across sites considering technical frames as generalised and collective orientations in different cultural locales, as well as local and concrete instances of technical practice. A range of material resources, technical skills and knowledge, and formal and informal divisions of labour are brought to bear to build a system, within organisations and across them.¹⁰ Building VR requires both technical and aesthetic craft skills.¹¹ These skills are relatively specialised, and (sometimes) require tertiary and/or apprenticeship training. Both the commercial firms (known in the computer industry as 'start-

ups') and alternative organisations tend to be small, and are sometimes widely geographically dispersed.

How this set of interactions becomes organised — how social or technical problems are identified and solutions offered, how different configurations of technology enable some market relationships, identities and forms of virtual embodiment and constrain others, relies very much on what is prioritised in production processes, and the perceived value in each frame of 'expert' and 'non-expert' work.

Virtual Reality Technologies as Engineering Practice

The dominant technical frame for building VR systems in the sites I studied is that of engineering and computer science practice. Virtual systems have emerged from, and are embedded in computer graphics, hardware, peripherals and software industries. The computer industry more generally, university computer science and engineering departments, as well as military (particularly airforce) projects, were all key sites from which virtual systems emerged.¹² Early in the history of virtual systems research, engineering and computer cultures (with their rhetoric of technical invention, research and development) provided a context enabling the development of virtual systems as 'ends in themselves'. As Hughes (1987: 53) notes, 'the problem to be solved ... may postdate the emergence of the [technical] system as a solution', hence the need for 'marketing'. In this frame, 'how' questions are often pursued to the exclusion of 'why' questions (Lee and Taylor, 1996). One industry commentator remarked that this was a lack of 'historical understanding':

Most of the current geek crowd has no perspective of where they stand in a larger social parade ... they don't realize that many of the problems that society and they wrestle with were dealt with a hundred and fifty, two hundred years ago... and even more directly to the point they don't realize that many of the technical problems that they struggle with were solved years ago in the mainframe computer business, but they have so little sense of the world outside of themselves ... To a certain extent that provides a freshness and an excitement and an energy that's valuable. To a certain extent it means an awful lot of resources are wasted ... I've seen many many times that these young engineers and programmers come up to me with ... a brand new solution to an old problem which typically is not as good as an earlier solution (Ben Delaney, Interview, Berkeley, June 1996).

In a 'VR engineering' frame, the engineer or computer scientist is the expert best able to employ technical solutions for solving human problems in the transformation and manipulation of both matter and concept. The manipulation of the physical world is carried out by those with the applied skills and knowledge to transform natural resources such as silicon and metal (as well as human-made chemical substances such as plastic) into housed electrical impulses, which are further organised into binary languages, languages into programs, programs into applications with their attached peripherals, applications into worlds.

The ideal figure is that of the 'inventor' or 'innovator', endowed with natural technical talent and curiosity, seeking the 'thrill of a major technological transformation' (Hughes, 1987: 59). According to Lee and Taylor (1996, forthcoming), the discipline of engineering has historically participated in the 'grand narratives' of modernist western science, with its highly valued ideal of linear technical progress. This progress is based on rational knowledge, which is claimed to be universal, autonomous, context-free, objective and generalisable (Grosz, 1988: 93-94). In this practice of engineering knowledge, engineering is highly gendered, technology being associated with mind, rationalism and masculinity, the feminine with body, irrationality, and domestic ordering of nature.¹³ The rationalist assumptions of technical development prioritise the technical over its 'others' (both 'natural' and 'cultural'), the implications of which are a sometimes unquestioned technological determinism (Lee and Taylor, 1996: 63).

This analysis is shared by different sectors in the VR industry. Doug Faxon, a virtual worlds designer, describes a scene at SIGGRAPH where there was

this one gentleman who was very much technologist sitting on a panel with a bunch of artists and the kind of arguments that he made to the points they were bringing up ... were really indicative of the clash between the two mindsets. It was ... funny to watch because in addition to what was being said, there was all this body language being exhibited too, like he was coming off with this really superior kind of I'm a scientist and I know what I'm talking about and you guys are ... armchair scientists, you don't know what you're talking about. And there's ... all this body language that conveyed that. And they [the rest of the panel] were just looking at [him] like 'you typical man ... you're giving us a bad name' (Doug, Interview, Santa Rosa, September 1996).

In an engineering framework, virtual reality systems are defined as functional or instrumental objects, subject to technical manipulation. As we saw in Chapter Four, one of the central contradictions for those building virtual systems occurs where they seek to do away with, or at least suppress, the ‘interface’ altogether. This desire to escape the very same technologies that are used to generate the escape routes is one of the central paradoxes of virtual reality and creates one of the most central contradictions in how VR systems are built. What objects emerge depends on whether the experience ‘of’ the system, or the experience ‘beyond’ the system, is the basis of design.

This point is underlined by the diagrams I asked some programmers to draw (as much for my understanding as for my research!) of virtual systems (see Fig. 8-1). In their drawings, programmers (unsurprisingly) drew on their significant technical knowledge to outline all the technical components of the virtual system (and ‘translate’ to terms I understood as a naïve participant/ observer).

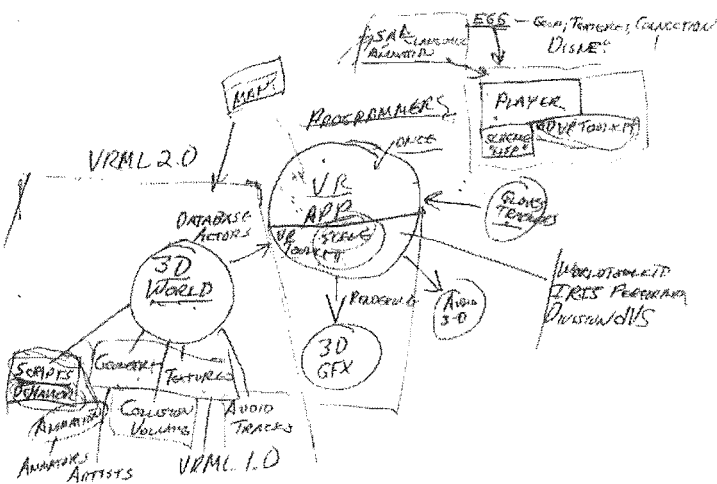


Fig. 8-1
One programmer's representation
of a (general) vr system

What I found interesting was the role of the human (‘player’) in this system who in terms of the spatial layout of the drawing, was a small add-in box on the top right hand corner (almost an optional plug-in). Additionally, the role of other professionals involved in building virtual worlds (such as animators and artists) appear in the lowest left hand corner. Such representations are mobilised to

assert the importance of technical means. They become ‘immutable mobiles’ (Latour, 1988), inscriptions whose form is mobile, whose content is immutable, and which are mobilised as resources in securing dominant agreement about how technics are to be organised. While the dominance of technics is unsurprising in context, they serve to make the technical dominance of engineering and programming in virtual worlds ‘conventional’.

Research and development are central activities in virtual systems building. As one manager in a manufacturing firm characterised the situation, the ‘rocket science’ in VR is in the software and hardware development, ‘inventing the thing in the first place’ (Martin, Interview, Palo Alto, September 1996). This tends to mean virtual systems are produced through the progressive development and prototyping of hardware and software (see Chapter Seven). Technical parameters take priority in the conventions of artefact building. This development involves changing the technical system in order to make better technical objects along (rationalised) measurement of effectiveness or efficiency. This is done by making decisions about how to improve the object’s design and operation, or improve the processes through which it is produced. According to Hughes (1987: 63), this innovation work entails embodying in an artefact the economic, political and social

characteristics that it needs for survival in the use world. The invention changes from a relatively simple idea that can function in an environment no more complex than can be constituted in the mind of the inventors to a system that can function in an environment permeated by various factors and forces.

While any number of experimental technical criteria are used, it seems that better virtual systems are those which a) fit more closely to human bodies to achieve a closed system, and thereby b) regulate human action cybernetically to achieve desired results, and c) do so in ways that builders attempt to make economically rationalised.¹⁴

Virtuality® presents its history — especially the early history of the organisation — as one of building better technical objects in an engineering framework. The founder of Virtuality®, Dr. Jon Waldern, entered the field through university based research in hardware and peripherals. His company formed around making this research and development economically productive.¹⁵ This trajectory is unsurprising given the increasing attention paid

to the emergence of a 'triple helix' in science and technology research: the intersection of universities, state, and corporations, and the sometimes fraught relationships between them (Etzkowitz and Leydesdorff, 1997). Lee and Taylor (forthcoming: 2) argue that engineering within universities 'is increasingly mortgaged to its peak profession[al] associations and the driving imperatives of (post)-industrial global capitalism', and go on to claim that an implicit entrepreneurial norm in engineering cultures defines the curriculum, which frames what is to *count* as the 'context' of engineering science and professional practice. Engineering practice becomes focused on business planning, resource management, and commercial law to the exclusion of social, ethical, political and environmental considerations.

The focus of the infant Virtuality® (then W Industries) was the development and production of head mounted display technologies, and this drove their technical design agenda. 'Proper VR' (Jon Waldern, Interview, Palo Alto, June 1996) is the development of head mounted displays and associated component technologies to drive not only entertainment, but home-based consumer markets. A promotional release claims that those at W. Industries 'originally developed workable prototypes of head mounted displays ... At the time, it was not possible to buy the component technologies needed to create products that could exploit the technological advances that they had achieved. So, they developed them in-house' (Vaughan, 1996). The assumptions employed include both technical and social determinism. Says Waldern, 'the biggest market is entertainment, then as the equipment gets better it will go into a variety of other areas' (Interview, Palo Alto, June 1996).

Virtuality®'s hardware network begins to extend when their technical objects become commercially viable, and are transformed into 'products'. Already established and newly created markets, coupled with a technical culture which prioritises technical research and development, provide the impetus to develop a core, generic technology — the production of a generally standardised and (relatively) mass produced object.¹⁶ This generic technology becomes a stable basis for organisational activity once it fills criteria on testing procedures: technical and economic criteria of effectiveness and efficiency. As Martin characterises the situation at Virtuality®,

[W]e have a basic core technology ... [T]hat core technology can be put in a whole bunch of different ... packages ... We had designer head mounted displays which

could be produced for low cost ... To a degree, effectively the design of the peripherals and the cabling — well it didn't change the core technology that it developed (Martin, Interview, Palo Alto, September 1996).

According to Martin, there has to be a working assumption that any new product will utilise this core technology. 'And if it requires additional hardware base, then unless it's very good, it'll most probably get thrown out. Because of the sheer cost of it again. Because we're kind of kajukied by the return on investment model' (Interview, Palo Alto, September 1996). The development of a standardised and more-or-less mass produced technical/ economic object/ product allows those in the company to position Virtuality® as a manufacturing and technology development firm, rather than a firm participating in 'culture' industries.

On the one hand, the ways economic and technical factors come together in the production of hardware constrains the potential products that can be achieved. Virtuality® can only make a certain kind of 'durable' product within the networks they have so far established. According to Martin, '[i]f you're creating a consumer product, then it has to be cheap. It has to be easily manufacturable. And therefore you're looking at ... how can we make something really cheap but still look as though it's got a great deal of value' (Martin, Interview, Palo Alto, September 1996).

This doesn't mean that the hardware remains unchanged. Changes are made to solve technical 'problems' on the assumption that technical development is 'good' in and of itself. According to Waldern, Virtuality®'s technology

is now becoming less of an issue of integration and hardware and all of that's pretty much on a critical path and engineering programs are in place to look at that. In two to three years time ... I'll show you a pair of glasses, you'll be able to see through, and you'll be able to see in, and at this time its already done and work is underway on it (Jon Waldern, Interview, Palo Alto, June 1996).¹⁷

Secondly, shifting market relationships also affect the emerging socio-technical network. Martin describes one of his projects as 'driving through a new platform': 'I'm trying to drive the [cost of] materials down, I'm trying to look at the ergonomics of a pod to ensure that the people can understand what's going on [with] sometimes intimidating technology ...' (Interview, Palo Alto, September 1996).

In the process of making design decisions, producers consider a number of interacting factors. Some of the factors taken into account in 'platform building' include technical decisions about frame rates, resolution and field of view in the head mounted displays, and the functioning and design of the cabling which connects the peripherals to the central processor. They also include 'ergonomic' considerations. Martin points out that aesthetic considerations in platform design also have to be ergonomic:

After all you're ... talking about moulded plastics [which] should have an ergonomic function ... the headphones of the display for example. They were designed to project the sound into your ears rather than enclose your ears. Whereby making sure that you're not totally removed from the real world in the event of a disaster, a phone call, somebody at your door, a fire bell, whatever ... (Interview, Palo Alto, September 1996).¹⁸

Ergonomics is not only a matter of human physical mechanics or perceptual/psychological norms. The labours of desire and pleasure performed by 'users' must be coded into the technical object, to be encouraged through it. These embodied pleasures are translated into technical, ergonomic or social problems which can be solved via technical design. The assumption is that some physical designs encourage certain bodily behaviours, while others discourage participation and pleasure:

[W]hen you've got a head-mounted display ... you're effectively blindfolded to the rest of the world ... how do you find your joystick when you're blindfolded? Who's looking at me? Who's pulling faces at me? What do I look like? ... [T]he unnerving thing for people is the fact that they're blindfolded and they can't tell what other people think ... [T]hose are the things that are just as important to solve as are the technical issues that we face and the content issues (Martin, Interview, Palo Alto, September 1996).

Once a technical object is 'perfected', it undergoes a process of 'collateral production':

Once we've got the product, how do we sell it to our customers, how do we position it, public relations, cover press releases, making sure we're getting all the right messages out to the key press ... At the same time looking at strategic relationships we have with other companies who want to be guided ... into the out-of-home [market] ... and filter that back into our arcade engine. And really all the time looking to see who can we work with to best get mass acceptance in the community and great popularity for immersive VR in public space entertainment (Martin, Interview, Palo Alto, September 1996).

This quote serves to point to two things: the first is that the technical product precedes the customer base — technology development drives the formation of markets through public relations. Demand for the product is created through the discursive positioning of technology as the only possible pre-existing ‘solution’ for an as-yet-unrecognised social ‘need’ or ‘problem’. Demand does not pre-exist production in some objective way. Secondly, the relationships established in markets, or strategic partnerships are ‘filtered back into the arcade engine’. That is, the form of the artefact is malleable insofar as relevant groups other than producers affect its design. The relatively stable elements of Virtuality®’s technical system are only challenged when other factors come into play — for example, the organisational and economic impetus for moving markets from location-based entertainment into the home.

Given a core technology (core hardware and their operating systems), what is most malleable, and therefore most likely to be filtered back into the arcade engine, are ‘applications’ — ‘top level’ software, which program the worlds that are ultimately experienced by users. The applications software is more malleable than the hardware (Quintas, 1996), and is built to fit around hardware standards. As we saw in Chapter Three however, the software is also ‘hardened’ around the particular genres and narratives of popular cultural industries. These generic narratives become stable as ‘content’ standards for Virtuality® products. The expression of a ‘VR engineering’ frame in software design and production is illustrated in the idea that ‘problems’ (or resistances) in narrative, interaction and genre, have technical solutions. Some of the initial problems in software design entail ‘fitting’ the software to the hardware, even as the software also develops independently. A software development team in ‘advanced applications’ talked about the hardware and the core software technologies they work with:

(Tom) [W]e have hardware that we develop for.

(Greg) The hardware software ... it’s already decided that’s ... what we have to use ... I suppose we’re in a product position where we actually develop the hardware ourselves, and that’s always ahead of what we’re writing for ... So that’s given ... I mean when you talk about the core technology you’re talking about the hardware ... But within the software side of it the technology is the ... actual programme shell ... [E]very time [the system] uses the core of it and then adds to it. So all the time that’s getting developed ... I mean ... the actual hardware could be ... same generation hardware, but the software could go through five or six generations ...

(Tom) Things like detection, joystick handling and all that kind of stuff as one generation, and that gets passed on between different experiences ...

(Greg) So all the time ... the code will be quicker ... which would take less process time, so you've got more time to develop stuff (Interview, Leicester, July 1996).

'Process time' is a technical solution to system building problems between hardware and software (such as the trade-off between graphics design and frame rates). At the same time, technical solutions also apply to the ways people interact with systems and participate in worlds:

(Tom) [S]tandard 3-D games that run on a PC ... you don't have to worry about the way the player looks at the graphics ... so you can, as soon as he [sic] gets past basically where the monitor's looking, you can click the object out. Whereas with VR you have to keep processing [the image of the object] ... So you have to think about that (Interview, Leicester, July 1996).

As we saw in Chapter Four, these applications, and how the user interacts with them, must 'fit' with the form of the hardware as a phenomenological object. When programming a VR game in a maze, such as Virtuality®'s Pacman, the programming which generates and controls 'movement' in the world must account for the form of the hardware:

Now we know that ... if you're in a maze, when you play Pacman, it's very easy to get yourself twisted cause you're tuning round so many times that you get twisted inside the cables. We don't want that happening. That's about how they're designed (Martin, Interview, Palo Alto, September 1996).

In a technical frame, the decisions made in software applications are about the form or behaviour of virtual bodies, objects and movements as they are programmed into the computer languages which generate the graphics which appear as a world. Because there are standardised source codes which run across different applications, the same set of problems and constraints is encountered in each experience (for example, the level of interactivity that can be programmed into the machine). The primary considerations are computing power and source code. When asked to identify problems in software development as an interface with a 'user', this software development team spoke in terms of technical solutions:

(Greg) [A user will] see a film like Lawnmower Man, they say oh that looks quite good, I'll go and have a go. And they get inside a pod and they think, hang on a minute ...

(Tom) They don't seem to realize that its real time ... there's that, and then there's the frame rate and the resolution and things like that. Its not completely disappointing, but it's not what they expected . I think that's that major problem ... (Interview, Leicester, July 1996).

In this case the software applications team produce 'solutions' to these 'problems' via changes in software. Problems which involve a 'misfit' between the cultural and technical elaboration of VR come to *work for* technical industries by providing them with problems to solve.

Thus far, I have described a 'VR engineering' frame as one in which individuals and organisations generate solutions to socio-technical problems. Technics are within the control of engineers, whether that be control over the technical system or the economic network in which it is embedded. Such understandings are generated by the discourses of 'technoscience', in which engineers are encouraged by engineering training to value capital development in the form of economic products as well as technical objects. Innovation tends to be technology driven, and is enabled by network building resources such as the networks of knowledge and power in already existing computer science and engineering institutions and industries. This produces particular kinds of VR systems which tend to be generic and standardised objects/products.

The pleasures and passions of engineering and computer science for those involved are the excitement of both creative and logical aspects of technical problem-solving. Jon Waldern notes that engineering is 'in a sense assimilating information from a variety, a plethora of different sources, and coming to a logical, creative next step, but utilising those other various examples out there, examples of engineering' (Interview, Palo Alto, June 1996). To make all the pieces 'fit' into a seamless, flexible and working system entails the abstraction and formalism which Star (1995) notes is the basis of engineering practice. To make clean, logical, conceptual, rational and integrated objects entails desire conceived as both mastery and submission. On the one hand, a discourse of noble and honourable (masculine) engineering pursuits posits the transcendent pleasures of mastering and controlling the messy natural and social ('Other') worlds through the elaboration of technical devices (Hacker, 1990: 207-209). On the other hand, the erotic is channelled through the desire to be

overwhelmed and engulfed by the object of desire, the technological 'other' (Sofia, 1992). Hacker (1990) argues that it is that latter impulse which compels many in the computer industry to work 70 hour weeks, sleeping under their desks and ordering in pizza, surrendering themselves to the dictates of the machine, and the power of technology.¹⁹

This passion, along with the skills and knowledge required to carry out technical work, marks off the experts from the non-experts, and institutes boundaries of exclusion and inclusion. Engineering tends to be a gendered practice, particularly in the cultural association of masculinity and technology (Massey, 1996). Ellen Ullman (1996: 11) however, puts a slightly different spin on this formulation. She remarks that the computer, as the engineer sees it

makes a toddler seem brilliant ... If a comma is out of place, it complains like a toddler who won't tolerate a pea touching the mashed potatoes ... This is the general definition of the modern software engineer: a man left alone all day with a cranky, illiterate thing which he must somehow make grow up. It is an odd gender revenge.

As I discussed in Chapter Seven, the conversations I had with people in commercial enterprises almost universally (and rather depressingly) assumed through the ubiquitous use of the pronoun 'he' that both producers (often reference to engineers and computer programmers) and users, were men. Gendered practices are also, however, carried out in the very bodily activities required to construct, for example, software code. As Ellen Ullman (1996: 12) notes, she is an engineer because

of a certain love for the intricate lives of things, a belief in a functional definition of reality. I do believe that the operational definition of a thing — how it works — is its most eloquent self-expression. Ironically, those of us who most believe in physical, operational eloquence are the very ones most cut off from the body. To build the working thing that is a program, we perform "labour" that is sedentary to the point of near immobility ...

This labour, as she illustrates, requires the suppression of the body for long and uninterrupted periods of time (1995). Understanding the organisation of time and space in this way is gendered by implication in so far as it excludes those participating in activities which maintain and reproduce ones own and others' physical bodies (such as food preparation and childcare). It is assumed that other

bodies, often wives or partners, will take up these tasks (Armstrong, forthcoming; Cockburn, 1985: 181).

The tacit knowledges VR designers and producers bring to their work in a VR engineering frame is articulated through narrating 'experience', both as engineers/ programmers and as individuals who find excitement and pleasure in the workings of computer systems. Because those who build the machines also use them, their own experience of using the machines, as well as the conventions and practices of building them described above, guide their design (see also Chapter Seven on 'markets'). For example, Martin remarks that

[M]ost of the people in our company that develop software also are pretty good game players, and they're always playing the latest games out there and they know what is a good game and what is a bad game (Interview, Palo Alto, September 1996).

This 'experience' positions technical experts in contradictory positions vis à vis their production practice. They draw on notions of experience, and the bodily and cognitive pleasures of play, as well as their practical and conceptual knowledge in technical construction. At the same time, the rationalism that underlies a technical frame may abstract and standardise these experiences into (what are thought of as) universal human bodily practices (Star, 1995). In the case of game design, Crawford (1984, in Myers, 1990: 30) notes that '[i]n a game, the designer creates not the experience itself [but] the conditions and rules under which the audience will create its own individualized experience.' As we saw in Chapter Two, the narrative formulae which arise from such standardisation are often adolescent, violent, and prescriptive. What specific abstractions are used in 'best practice' ('satisficing' the local cultural and economic conditions; MacKenzie, 1996: 51), in local contexts, is therefore important.

Lee and Taylor (1996: 62-63) argue that the particular abstraction and rationalism in engineering takes logical positivism as its most extreme expression, which ultimately excludes discussion of ethical, social or cultural issues as scientifically unverifiable (read meaningless), and therefore outside the purview of engineering disciplines. Instrumental rationality, technological determinism and the position of the 'master subject' can therefore go unexamined. According to Lee and Taylor (1996) there is therefore little

discursive, institutional space for engineers (or computer programmers) to discuss the cultural or political dimensions of technologies, to talk about who is included and excluded by the technical decisions which are made.

It is tempting to attribute considerable material and cultural power to those who are both discursively and materially positioned as 'VR engineers', as they collectively build virtual reality technologies. Mark Slouka (1995: 33), for example, argues that those who wish to engineer a virtual future,

have the funding and the technological sophistication to make good on many of their wildest prophecies. By grafting the tradition of millennial dreaming onto both the free market and a powerful new technology ... they [threaten] to make it possible not only to sell the age-old dream of the Heavenly City but to rent out space there.

The 'dreams engineers have' (Thieme, 1997) are socially and culturally generated as well as technically mediated. As gendered practices, theorists such as Kramarae (1995) worry about both the form of the technologies, the worlds we might live in, and the role (or not) of girls and women in programming those futures.

Bijker (1997) points out that frames are not individuals. The discourses and practices employed in technical construction are achievements. They are the effects of institutional, historical enablements and constraints, as well as constructions negotiated out of multiple and sometimes contradictory local frameworks. I have examined the ways this framework operates via the discourses members of Virtuality® draw on to position themselves and describe what they do. A technical frame also operates via the conventions and standards of practice which institutionalise those discourses in socio-technical interaction, and which give objects their form.

Martin recognises the ways that socio-technical practice entails considerable more complexity than straightforward ideological mapping. Different sets of discourses and practices co-exist within organisations:

One of the things about this Company is that it has so many different people ... wanting to pull in different directions that half of the problem ... is trying to harness all that energy and saying well this is the right way. The fact is nobody knows which is the right way yet — yeah not hardened fact (Interview, Palo Alto, September 1996).

A 'VR engineering' frame is not restricted only to those engineers and programmers working within commercial VR companies (or even to those with formal engineering or programming training). It is found amongst a number of communities of practice and interest. For example, it is strongly consistent with some dimensions of 'garage' VR organisation. The ideal of the inventor figure runs strongly throughout 'garage' practice. Certainly, popular books such as Linda Jacobson's (1994) *Garage Virtual Reality* are devoted to the technical construction of VR systems, and their development as a technical basis for world building.

Doug Faxon, for example, says that in 'garage' VR,

[w]hat we originally set out to do was to improve this interface so that the world at large could have access to it ... and that pulled us together tightly as a group. Now that ... our goal has been accomplished, we don't have that focus anymore. Now it's refining, but a lot of the technical issues that we were trying to address at the beginning, have already been addressed (Interview, Santa Rosa, September 1996).

Furthermore, the experimental location of the inventor or hobbyist figure is gendered through its (albeit amateur) alignment with engineering disciplines. Kirkup (1992: 271) argues that historically, the craft skills embodied in hobbies like electronics are masculine because they are seen as processes, as ends in themselves. Hobbies undertaken by women tend rather to embody the domestic labour which focuses on domestic products (see also Haddon, 1988, 1991). The leisure time available to men to pursue these ends is greater than that of women.²⁰

A 'VR engineering' frame is identifiable across different worlds and groups, but one cannot assume there will always be agreement amongst those groups. Jon Waldern remarks that

there is a lot of scepticism about VR by quote 'serious engineers' and 'serious people'. Frankly they just don't understand it. There's a very colloquial and very accurate expression for probably most of their comments — I think its 'talking out your arse' ... [T]hat isn't dissimilar to other historical examples ... [E]ven if they're serious engineers, they may not have exposure to enough of the discipline to make that jump (Interview, Palo Alto, July 1996).

Conflict or disagreement amongst producer communities can generate different objects, and rework systems. What the technical object is becomes differentiated

interpretively, but also as an object in practice — defining social categories and events such as work and play, self and other, knowledge and power. For example Karin, a media commentator, and administrator of a VR special interest group (VRASP – see Chapter Seven), argues that building a VR world entails a certain creativity that is not necessarily found within engineering or programming practice:

you really have to have a certain skill to be able to create worlds and I don't know that those people, who have that skill-set, are necessarily the most creative people, because they're engineers, programmers (Karin, Interview, San Jose, September 1996).

Others also argue that it is possible to 'do' VR without those programming and engineering skills. Brenda Laurel (1990) argues that the art of human computer interface design is primarily a matter of narrative and storytelling, of theatre, drama and character, and most of all, a matter of 'prostheses for the imagination', where VR systems are media, rather than tools. In *Computers as Theatre* (1991: ix), Laurel's approach is differentiated from a VR engineering frame in the introduction by Donald A. Norman:

[T]hese technologies offer new opportunities for creative, interactive experiences and, in particular, for new forms of drama. But these new opportunities will come to pass only if control of the technology is taken from the technologist and given to those who understand human beings, human interaction, communication, pleasure, and pain. It is time for the engineers to go back to engineering.

Some make their critique of a 'VR engineering' frame through poking fun at the objects the VR industry produces. As Judith Squires (1996: 211) notes, political metaphors which allow one to grapple ironically with dominant images, knowledges and discourses include mockery and mimicry, a parody in the service of appropriation. The evil Dr. Flaxon, for example, develops interface devices such as the Trout Mask HMD (see Fig. 8-2), the Baseball Bat haptic feedback device (see Fig. 8-3), and the cybernose (see Fig. 8-4).²¹ In brief, critics of 'Dr. Flaxon' believe that

there's no real commentary to any extent from the engineering standpoint of what constitutes a good interface versus a bad interface. There's a lot of high level technical stuff written about these things but to the man [sic] on the street ... we don't understand the issues. So Flaxon ... makes it very apparent by doing everything the worst possible way. Because this is what we're afraid of. We're

afraid of this technology taking us over and being used for brain washing and torture devices by the CIA ... So Flaxon ... shows those things as the worst possible manifestation of this technology, and so if we know [what] the worst possible manifestation is, maybe those of us that are pre-disposed to, will be inspired to do exactly the opposite, create good interfaces (Doug Faxon, Interview, Santa Rosa, September 1996).

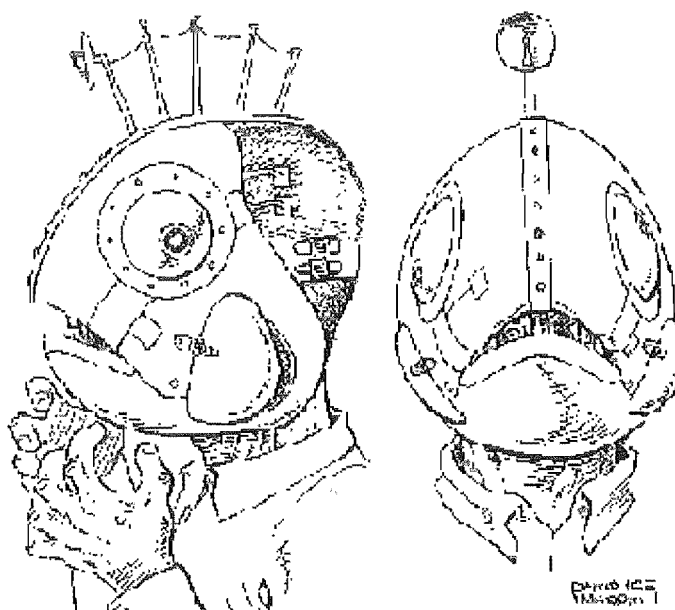


Fig. 8-2
Trout Mask HMD
Artist, David Ingersoll
© Courtesy of The Evil Dr. Flaxon
[http:// www.sonic.net/~dfx](http://www.sonic.net/~dfx)

According to Doug Faxon, engineering-based approaches are not identifying (nor solving) the important problems in VR systems:

The key factors that they've been concerned with have more to do with the physiological interface than the emotional interface in a sociological definition, I should say. From what I've seen, they're more concerned with making a head-mounted display visually give the sense of immersion as opposed to concentrating on the interaction in the world (Interview, Santa Rosa, September 1996).

Comments like this highlight the point that working contradictions arise when it is recognised that virtual reality systems are not only technical objects, but also media. When Virtuality® positions itself as a manufacturing and technology supply firm, and when engineers position themselves as those who employ technical methods to arrive at solutions to technical, economic and social

‘problems’ in the construction of objects, the technical frame embodied by their labour does not recognise that they are simultaneously performing cultural and social work.

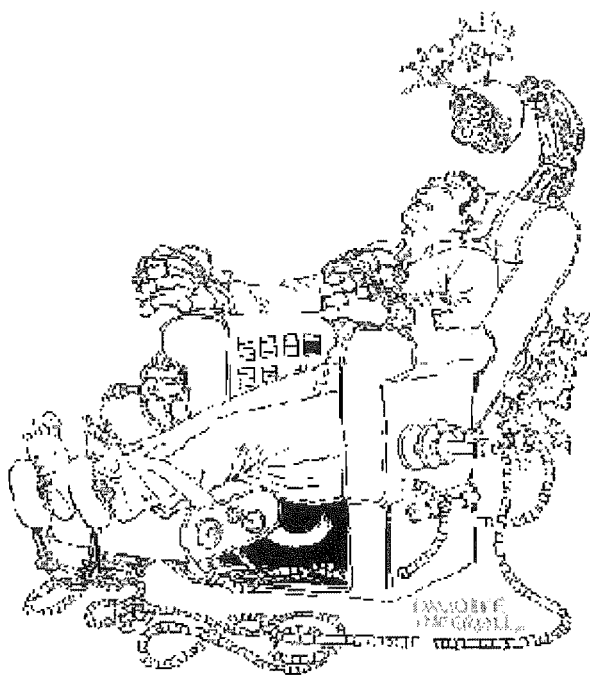


Fig. 8-3
The Baseball Bat Haptic Feedback Device
Artist: David Ingersoll
© Courtesy of The Evil Dr. Flaxon
[http:// www.sonic.net/~dfx](http://www.sonic.net/~dfx)

An orientation toward VR as media is far more apparent in other frames: frames which co-exist with, and create tensions within and between multiple individuals, groups, and organisations.

Virtual Reality Technologies as Community

One such frame is that of (what I am at the moment calling) ‘VR community’. This orientation to VR building positions virtual systems as technical artefacts which are specifically media: as instruments of expression and communication in community formation. As Brenda Laurel (in Morgan, 1994) notes, the concept of medium is ambiguous:

a medium can represent tools. A medium can also represent agents and companions and friends and worlds ... Where it has to go is the way of the printed word, where it has to be accessible to everybody and where there's no context difference between the authoring language and the presentation language. You don't write in a different language to write a book or to take a photograph. You have to know something about the technology but you're working in the language of images.

This orientation tends to prompt a mode of technical construction which participants position outside already institutionalised networks of technical resources and practice.

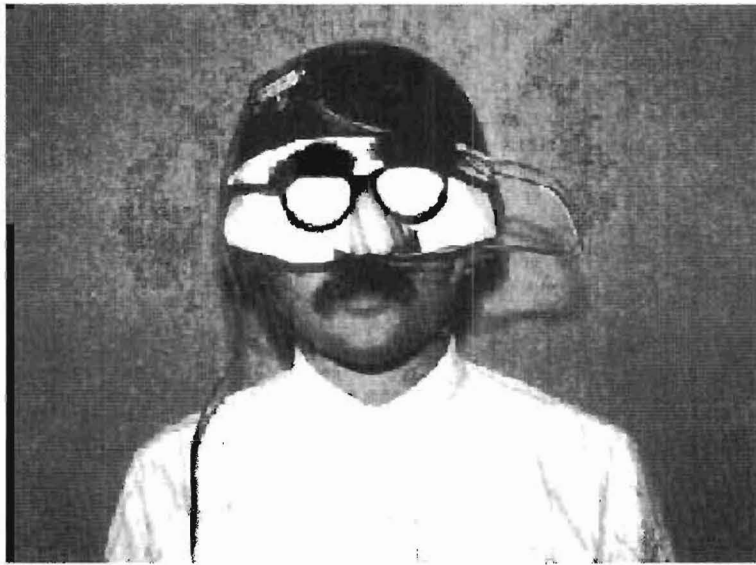


Fig. 8-4
The Cybernose
[http:// www.sonic.net/~dfx](http://www.sonic.net/~dfx)
© Courtesy of The Evil Dr. Flaxon

There are two implications of this 'outsider' status. The first is that people who position themselves as workers in 'culture' or 'community' in various ways have rather weaker institutional bases on which to draw to extend their socio-technical networks. Their systems tend not to become durable, nor widely distributed, nor do they necessarily become 'obligatory passage points' for others in technical networks.²² In this case, concentrating on media and community offers some benefits in the position of 'outsiders'. As Hughes (1987: 59) notes,

the independents [have] the insight to distance themselves from large organizations. They rightly 'sense' that the large organization vested in existing technology rarely nurtured inventions that by their nature [contribute] nothing to the momentum of the organization, and even challenge the status quo in the technological world of which the organization was a leading member.

'Community and 'industry' frames of reference are thus differentiated from one another. The community orientation has oppositional and marginal agendas. Doug Faxon, an enthusiast and active participant in virtual reality communities, articulates these agendas:

I think there's a general difference in attitude about the freedom of information when you get into the industry proper, being on the fringes of it, like I am ... I was told a few years ago by somebody who I have a lot of respect for ... 'do yourself a favour and don't sell your soul to ... to some big corporation just for money' ... [Industry] involves forming alliances which I like to be ... independent of ... I don't want to get into a political pissing match between two different companies that are both doing things that I'd like to see done. So I'm staying on the outside for the time being and it's kind of lonely out here but it's also pretty interesting in some ways (Interview, Santa Rosa, September 1996).

While many say they would 'rather wind up doing VR than writing about it or designing Web pages about it' (Doug Faxon, Interview, Santa Rosa, September 1996), this marginality nevertheless implies more 'freedom'. The formulation of problems, and the solutions to them become explicitly a matter of subject as well as object manipulation. Social relationships become written into technical practice. Objects are constructed and problems identified as an extension of selves and relations which can have both technical and social solutions. Karin argues that she become involved in garage VR on this basis:

What it was for me, was the interaction of people and that's what we're coming closer to achieving now, with the advent of the three dimensional worlds and being able to talk real-time (Karin, Interview, San Jose, June 1996).

A 'VR community' frame provides a number of discursive resources on which VR producers can draw to understand themselves and their work. Just as an engineering frame draws on institutionally elaborated notions of technology and its value, a VR community frame draws on dominant liberal notions of 'freedom' and 'community' as articulated through 'grassroots' democracy. Technical results are not seen as an economic product, but rather a meeting of minds, of curious people, through techniques.

So we came at it from the standpoint of being very grassroots purely voluntary ... no company that we worked for said you've got to start hanging out on cyberforum and learning what you can about this. [W]e voluntarily joined together and created this community for the furtherance of disseminating information and working in our own ways in whatever capacity we're able to ... I feel like we're all kindred spirits. We're all working towards goals, even though our goals are widely divergent, they all centre around bringing people together through cyberspace (Doug, Interview, Santa Rosa, September 1996).

The rhetoric of expertise is therefore replaced by notions of democracy and community in this practice of virtual systems building. Technical skills are not necessarily the most important skills to have, and expert status is formulated around aesthetic and organisational skills. According to Karin, she was involved in VR because

I could direct people because I had an aesthetic sense and ... the conceptual sense. I can verbalise it. So even though I wasn't actually doing object geometry and building worlds, you know, I could help people who were (Karin, Interview, San Jose, September 1996).

What is also considered valuable are notions of communication, between socially and culturally differentiated groups, and an awareness of the power dynamics inherent in such communication. The ideal is to produce interfaces in which 'users' may build worlds themselves from the inside in ways that are empowering for them. Although not always achievable by virtue of marginal status, the ideal that 'users' might hold power is a result of the contradictory status of 'garage' VR people who are both inside and outside the VR industry:

That is it exactly, making the interface easy and flexible ... A tool kit something like that for the user, not the programmer ... And that is something that needs to be done. When it comes to the level of being in your home, and you are not technically minded ... that you don't have to be technically minded (Stu, Interview, Christchurch, July 1995).

It should be noted that this particular formulation assumes a division between those that are technically adept and those that are not (i.e. programmers and users respectively), as in an engineering frame. The community practice of VR constructs power relations differently however, because there is the possibility of 'users' finding their own solutions to their own problems. As an ideal, knowledge is to be shared in a community, and both skills and methods/ techniques are

shared with others through techniques such as bulletin boards (virtual communities), special projects or interest groups, even though individuals tend to put together systems themselves.²³

The boundaries between 'engineering' and 'community' approaches are worked out in a number of industry forums. Doug Faxon argues that the crux of the matter is the simultaneous status of (some) VR systems as patented and often privately owned economic products:

I think my basic philosophy with information is that it wants to be free and I want to make it free. I was talking to [someone] about this earlier. He says yeah, information should be free but landlords need to be paid. [T]hat's basically the crux of the whole issue ... I think those of us operating in the fringe, the garage community, experimental community, would just as soon share their information, you know. It makes it easier for everybody and it creates that sense of community (Doug Faxon, Interview, Santa Rosa, September 1996).

The ways these differentiations are made within VR industry and community maintain different agendas in the design of virtual systems. What the objects are, their meanings, and the conventions which exist for building objects produce differentiated systems. Because the 'objects' produced by those working in this frame are not (necessarily) commercial (and they are not working under the rubric of public institutions either), their technical conventions are firstly mediated by what might be desirable in technical development (see Fig. 2-4 in Chapter Two for garage made HMD and glove combination). Conventions are also mediated according to notions of community, and how much VR builders can afford to pay for pursuing their desires to build virtual realities. Their systems therefore tend to be put together out of equipment that has been used for other things and are 'hacked' together, or cheap alternatives to commercial parts, or objects/ systems invented 'on the fly'.

Doug Faxon talks about one such system he put together for a VR World conference, using a baseball helmet, an exercise machine, a 386 PC and off-the-shelf graphics programmes. The Mattel® Powerglove™ which Doug mentions below was a very popular 'hack', and is shown in Fig. 8-5 (see Jacobson, 1994: 221 for instructions on how to 'hack' a Powerglove™).

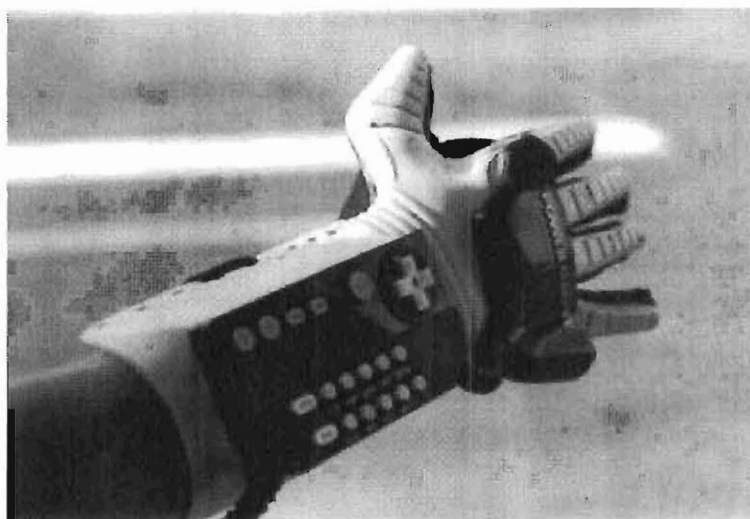


Fig. 8-5
The Mattel® Powerglove™
Photo Linda Jacobson
© Jacobson (1994) p. 135

Doug's system demonstrates some of the processes used which are both inside, and outside the technical conventions of institutions in the field:

I was working with ... a DOS programme ... that you could run on a 386 or 486, [in which] you could tell it to render and it would render ... mountains and the trees and the view and the contours of the land ... And then I thought, wait a minute. Ok my wife's got a stair climber ... So pretty soon I was hacking up my wife's stair-climber ... I interfaced ... magnetic switches that would actuate when you stepped on the treads ... [I]t would take five minutes to generate a scene with a hundred thousand polygons, so it wasn't fast enough to trace it on the fly. It wasn't virtual reality ... So I ... interfaced the stair-climber to [another programme]. And I had grand plans of connecting little servo controllers to it so that if you encountered a hill, it would give you some more resistance on the stair-climber ... I thought, we've got power gloves that are a crude but useful 3-D positioning and pointing interface for a PC level thing ... So I thought, we should be able to use this to do some kind of head tracking ... So I created a helmet, a baseball helmet that had the ultrasonic sensor from a power glove mounted in front of it ... so you could, by very subtle head movements, turn in virtual world and you had your power glove so you had a hand in the virtual environment, you had your legs working and you had your head working and in more or less normal fashion ... So we had the whole body involved and we did this on a budget of a hundred and fifty dollars worth, not counting the computer that we were using to do it ...²⁴ [W]e showed that we were doing stuff that more advanced computers were doing, although not quite as well, but we were still able to create some kind of virtual reality experience in the hall for pennies on what the big guys were doing (Doug Faxon, Interview, Santa Rosa, September 1996).

This kind of techno-cultural ‘pastiche’ is legitimised through its connections with the invention, research and development orientation that is an element of a VR engineering frame. It is also marginal as it neither ‘fits’ with the blueprint of market relationships in the industry, nor does it adhere to conventions of technical practice involving standards, patents, or regularised (institutionalised) rules and roles. It is both made possible, and constrained, by the network of groups, institutions and access to materials which ‘garage’ or ‘experimental’ VR builders (do or do not) have.

While a place on the margins of industry means that ‘hobbyists’ do not have access to some networks of material and knowledge-based resources, both garage builders and those in industry firms seem to agree that this produces a ‘freedom’ which those in corporate production desire:

Garage people are ... purely going for it ... [taking] risks, to risk offending people ... to risk pushing it to the limit ... We cannot necessarily afford those risks and we’re very concerned about ... making sure we can supply ... extremely safe, without risk to health, VR systems. I’m not sure whether all the garage operations are so worried about that. They just want to be out there to create something that’s cool — it must be great to be that free (Martin, Interview, Palo Alto, September 1996).

It is not simply the case that a VR community framework excludes considerations of economics in the political interests of democracy, community and freedom of information. They are inescapably constrained in their technical practice by the material relationships which circulate economic exchange: especially the role of labour markets in the VR industry. Doug Faxon is interested in reconfiguring some of the ambiguous relationships that sometimes exist between ‘industry’ and ‘community’ in the interests of creating markets for his skills and products:

I wouldn’t mind developing some partnerships with some companies ... depending on what it is that comes along ... [E]ven though prices have dropped significantly ... the later [VR building resources] that have come along still seem to require a large influx of money, and a lot more of it now is due to marketing constraints than the actual technology that creates something. I could create a great game ... but where can I sell it? ... So, I’m not really interested in spending a whole lot of time creating such a product until I know that I’m connected to somebody that can market it successfully (Doug, Interview, Santa Rosa, September 1996).

This depends on making links into industry communities — to which some industry organisations are receptive under certain conditions:

[W]e'll give them a mechanism through which to ... make a lot of money. [T]hey will supply great software that our operators can buy and ... they'll get a royalty from each piece sold and they've got no worries about trying to do all the hard work and really the ground-breaking stuff that we've done in building up an infrastructure and going through all of the health and safety, make sure that the optics work, understanding the ergonomics of methods, requirements of VR. All they've got to worry about is creating great wacky titles (Martin, Interview, Palo Alto, September 1996).



Fig. 8-6
Tom Zimmerman and Glove
Photo Linda Jacobson
© Linda Jacobson (1994), p. 7.

Furthermore, it is possible that products which have emerged from a 'VR community' framework will become commercially successful (Jacobson, 1994). Tom Zimmerman's early ten dollar gardening-glove-with-plastic-tubing-and-phototransistors provided inspiration for the Dataglove which he later marketed with Jaron Lanier under VPL research Ltd (see Fig. 8-6 for an image of the early

glove) (Jacobson, 1994: 6-7). These products can become standardised on their entry to VR markets, and can sometimes, as in the case of VRML,²⁵ become standards in themselves. As Doug Faxon notes,

you know it's not just us anymore ... It's not just us against the world. Now liaisons are being formed and there's partnerships being formed between us and the computer world in general ... more people are coming in because its been more popular, it's been hyped up ... (Doug Faxon, Interview, Santa Rosa, September 1996).

In the main however, the VR systems produced under a VR community frame are experimental, put together on the fringes of conventions and industry relationships, and are therefore specialised, 'one-off' objects. Their markets tend to be other VR systems builders, as well as media and specialists within graphics and computer industries more generally (see Chapter Seven).

Both a 'VR engineering' frame, and a 'VR community' frame can inform practice in different locales. Just as there is a strong engineering lean in garage VR, community concerns also appear in the orientation of entrepreneurial or corporate virtual world design. The 'advanced applications' team at Virtuality®, for example, talk about shared worlds as one of their ideal projects:

(Tom) One of the other things I'd really like to do is actually do a VR experience which everybody can experience at different locations around the world and see it over the Internet. And I've played live games on the Internet and you'd be fighting with people from Australia, from America. It gives it a sense of community where you actually go, you always be, in the game, playing away (Tom, Interview, Leicester, July 1996).

Those who build commercial systems also see their applications as a way to develop aesthetic dimensions of virtual world design through drawing on collective enterprise.²⁶ Martin talks about the aesthetic skills needed in designing software. A number of groups of people work on software applications for Virtuality® systems. Martin describes the 'prototyping' process:

On a software design, we'll go to a written one paragraph, that's how it starts ... quick description of what the game is, what the objective is and why it will work well in VR. Then we'll filter that down from ... twenty or thirty ... to about ten which will then go to a two-pager, and we'll detail ... what its going to be like, what its going to do, how its going to make business ... So they'll make a decision: high risk for potentially high return, [or low risk]. That [latter] way you kind of kill the potential of having a runaway blockbuster off the wall success: but it does

hopefully maximise your chances of success. From that we'll then go down to three or four ... of doing a full story-board — with drawings, illustrations and explanations of every stage ... The software development teams would [do this] ... or ... they'd probably do their rough sketches and then depending whether its going to go externally or not, we'll have an artist ... to draw them up so that they can be understood ...²⁷ And it's [a] process you have to go through before you actually commit the ... money, the ... development time, which is a lot of man hours and external costs. As soon as we're happy with the story-boards we might go through several different iterations ... and that whole process can take two or three months. Then we'll go to developing the prototypes in VR (Martin, Interview, Palo Alto, September 1996).

Software development teams work up applications to run on Virtuality®'s systems, but this development work extends far beyond computer programming skills. Artists are required, as are musicians and sound engineers, as are writers and producers. In Virtuality®, this expertise is distributed internationally, and project teams get put together on a per project basis, as often as they work on standardised applications. The software is further distributed amongst teams who provide feedback on 'how it plays', and how it might be modified according to 'their particular needs or perceptions of what will sell' (Martin, Interview, Palo Alto, September 1996). As Martin notes, these decisions are not quantifiable:

It's very difficult to ... [define this] intangible thing called 'game play'. What is game play? What is the look and feel? Why does one game arguably, technically [perform] as good as it should ... but one plays so much better than the other? There are little nuances in game play design, which our guys are very good at, and understand, and they are universal rules I suppose (Interview, Palo Alto, September 1996).

This focus on the quality of images, on the conceptual work which goes into designing interaction, and the cultural work that those images and interactions will do, resonates with the rubric of a 'VR art' framework.

Virtual Reality Technologies as Art

Like a VR community frame, a 'VR art' frame shares an appreciation of technologies as media of communication and expression rather than as purely economic objects or technical artefacts. As we have seen in earlier chapters, virtual systems are ways of seeing, knowing and understanding. The development of technologies is therefore framed through technique in the

service of image and concept. Experts are those with skills in fine arts, performance arts, philosophy and aesthetics (or occasionally cultural studies or social theory), who may or may not have technical expertise. In the systems and sites I examined such as OSMOSE©, Placeholder, and Detour: Brain Deconstruction Ahead, technical experts worked in a division of labour under directorship of artists, while at other times, expertise in art and computing are found in the same person. The artist is the ‘author’ of experience and expression, and users are positioned primarily as audiences to the expression of the artist.²⁸ Users can be offered different degrees of interactivity, or (at least potentially) provided with the tools and interactive parameters to create worlds.

A concern with the nuances of image, meaning, concept and aesthetic can sit very uneasily with the dominant engineering frame — occasionally prompting disjunctures in the legitimacy of particular skills and techniques. As a lack of technical skills might well be seen as illegitimate. Some artists apologise for their lack of technological know-how, even while acknowledging that their contributions are valued and valuable (Addison, 1995). This can be a cause for tension in VR communities. Some, particularly ‘garage’ people, talk about the ways VR has been captured by technological élites. In the overlapping communities of VR production there are therefore constant struggles over who has a voice, who is marginal, and who can speak as ‘experts’.

A discourse of virtual systems as art media is often highly resistant to the engineering frame, and views technologies, alongside practices of representation and word/ image making as highly political projects (Challas, 1995). The generic objects which emerge from a commercially legitimated engineering frame are rejected in favour of distinct, one-off works of art whose social value lies in the uniqueness of the work, and the status of the artist as author of expression. While VR systems are tools in one sense, for those who view VR as ‘media’ the primary ‘products’ are also the experiences, relationships and ideas that are generated through those systems. This orientation prompts a redefinition of the object, and encourages a political reflexivity about its form. Char Davies and John Harrison (1997), for example, argue that virtual reality technologies are not ‘value-free’, but are rather expressive instruments whose own internal conventions and technical imperatives can be subverted. This involves reflection on the very means of representation and of the spaces created by virtual systems. The focus of VR production shifts to aesthetic and conceptual/ perceptual work

as the ground for communication and relation. In this frame, technical development is a goal only in so far as it works towards aesthetic and human social ends. Doug Faxon talks about 'sitting back for a while, waiting for technology to catch up to [his] vision' (Interview, Santa Rosa, September 1996).

The problems in a 'VR art' frame are therefore cast in terms of how to communicate see, understand and know through that media, and conceptual, aesthetic and narrative work is the solution, in understandings of self, action and interactivity. As Doug Faxon understands it:

[M]y concept of VR ... was breaking down this wall between what's in my skull, what's in your skull. I want you to be able to see the world through my eyes, to understand what it's like to be me ... And it[s] one step closer to eliminating the space between us, spiritually, in some way. And that was the great potential that I saw in virtual reality and still has yet to be manifest ... taking it one step further each time, humanising that space and allowing us to really experience something through someone else's eyes ... (Doug Faxon, Interview, Santa Rosa, September 1996).

This frame tends to be software driven rather than hardware driven, as the graphics produce the images which do the communicating. Doug argues that the story

is what is lacking so much in the worlds that you see, particularly in the industrial thing, is content. They're concerned with a particular aspect of content which has practical applications. The flip side of that ... what you don't see a lot of ... is it being used as a medium of expression of artistic concepts (Doug, Interview, Santa Rosa, September 1996).

In this frame, hardware, and the software needed to generate worlds, tend to be made to fit to artistic, conceptual parameters. A 'VR art' frame therefore sits uneasily between both 'VR engineering' and 'VR community' frames. Its objects therefore tend to be 'split', standardised in some ways, customised in others. Some objects are brought together through the institutions and rhetorics of high culture industries to gain legitimacy for their practices, and the form of their objects. Other projects enacted under a 'VR art' technical frame are located in more loosely organised and individualised garage contexts, posted in VR community groups sitting on commercial computer servers.

Here, I will focus on OSMOSE© because it provides a good example of how an aesthetically and culturally defined conceptual starting point prompts technical development when virtual systems are framed as 'art'. There is a conceptual

starting point to all 'art'. Although it also evolved in practice, OSMOSE© had an ambitious conceptual genesis — multiple worlds, experienced in real time, through an aesthetic medium grounded in multiple, simultaneous and overlapping points of view.

As we have already seen, OSMOSE© is a set of simulation technologies which closely resembles other immersive systems in public use. It utilises many of the same pieces of bio-apparatus, and techniques of perspective and placement as other commercially available worlds. Because it is software driven though, and because it is a 'one off' work, the producers of OSMOSE© borrowed much of the hardware for the system.

At the time OSMOSE© was being created, throughout 1995, many increasingly affordable head mounted displays were appearing in commercial markets. A range of products that were not previously available — from the relatively simple and cheap models for home use to the very high end displays primarily produced for military use — were now being marketed to VR producers. The head mounted displays for OSMOSE© needed to be able to cope with a potentially large data set from the computer (which affects the temporal and motion-based aspects of the world), had to be fairly hardy for public use, and had to meet some bottom line criteria suggested by the aesthetics of the piece. That is, as a fully immersive high quality world, that was being presented as an exploratory showcase for virtual reality as a medium, the head mounted display needed to have high quality graphics and stereoscopic capabilities.

Similarly with the processor used, the ambition of multiple and overlapping worlds went far beyond the processing capabilities of simple and cheap processing alternatives. The computer which would run OSMOSE© would fundamentally have to be very large and very powerful. The answer for those at Softimage® Inc. was a Silicon Graphics Inc.® Onyx™ processor. It is very large and very powerful, as well as very expensive. Put simply, the Onyx™ was far too expensive to obtain as a piece of standing equipment for the work, and instead the team had to borrow it from its manufacturer, Silicon Graphics Inc.®. The ongoing problems this has presented for the distribution of the work become apparent in the process of setting up an installation.

Unlike other systems, there are technical elements which were custom-made for participation in OSMOSE©, and which the developers had to produce themselves — for example, the 'vest' which tracks breathing rather than gross

bodily motion, and which was described in Chapter Four. This device was custom-made; the use of breath for navigational control is an innovation prompted by the conceptual orientation of the work, and not a device that is mass-produced. This device integrates the hardware, software and content to such an extent that the particular devices in the bio-apparatus utilised for OSMOSE© are specific elements of the experience. Instead of the connection between human bodies and machines being conceptualised as a technical ‘problem’ to be solved — which at least should be ignored, and at the most needs to be transcended — Davies feels that the intimate connection between bodies and technical artefacts in virtual reality technologies explore the potential of the technology as medium to specifically explore kinaesthetic and synaesthetic, subjective, experiential embodiment.

It seems that the software is one of the most crucial elements of OSMOSE©, which positions the work as a technical system and bio-apparatus in a ‘VR art’ frame. The software technology, with its multiple and overlapping perspectives, allows for ambiguity and simultaneity in interpretive participation. In OSMOSE©, the customised VR software which built the worlds needed to be produced ‘from scratch’. After Davies had spent some initial time on writing about the vision and sensibility of the work, had formulated and developed some of the conceptual parameters, and had presented her proposal for the work to Softimage, a full year was spent in the testing of various techniques. John Harrison was the author of the virtual world-building software, and Georges Mauro authored the graphics in the piece. Both, Davies feels, understood her vision for the work, and have since collaborated on another piece called *Éphémère*, released in 1998. Two others, Dorota Blaszcak and Rick Bidlack came in (from Poland and Seattle respectively) to design and engineer the sound, and to program the music for the piece.

After initial testing of techniques across the space of a year (between early 1994 and early 1995), the world building — which was done via immersion in the emerging worlds — took place over a period of 6 months from early 1995. Davies (1995: 2-3) notes that once the production team were able to become immersed in the worlds, her ‘attempts at pre-scripting various possibilities were superseded by responding in situ, in immersion, to the work as it progressed. In this way, the creative process itself became very much like the act of painting, a

combination of planning and serendipity, where a single change affects everything else ...’

Davies (1995: 5) argues that orthodox virtual reality programming relies on ‘everyday experiences of terrestrial space’, which bias these constructions towards ‘walking on treadmills, bicycling, and driving with joysticks’, as was discussed in Chapter Four. In contrast, breath navigation seeks to ‘transcend’ this ‘everyday’ state by focussing more on the embodiment of the subject connected to the technology, by making their embodiment an explicit component of the navigational apparatus.

A ‘VR art’ frame links with engineering frameworks when the objects used are ‘high end’, and oriented towards research and development. The software development for OSMOSE©, for example, employed an engineering frame, even as it developed aesthetic and conceptual orientations, because one of its explicit aims was to develop VR technology (see Chapter Seven). OSMOSE© uses a pastiche or bricolage from the conventions and institutional practices of art, technology and corporate cultures. The changes that OSMOSE© makes are at the meeting and overlapping points of these worlds.

How those margins are constructed in an ongoing way, however, depends on how industries and communities are emerging as organisational entities, and what possibilities for economic and cultural life they offer. As we have seen, the ways that markets are organised, and the design decisions enabled and constrained by the technics, has different implications for different groups. How companies work as organisations, and how community groups and disciplines of practice are organised, affects what is possible to create in objects and worlds. Such dynamics situate VR as technical objects in wider and heterogeneous organisation.

At the same time, a ‘VR art’ frame links with ‘garage’ VR in criticising mainstream commercial production of content, and focuses more on stories, narratives, images, and experiences. A ‘VR art’ frame claims humanist knowledge and skill in comparison to technical expertise, and positions the systems under its rubric as oppositional, if not always as institutionally marginal as garage VR. They also share the feeling of many of the ‘garage’ people in their peripheral location — and as such are social critics, outside ‘the establishment’ — or at least the cultural establishment of commercial content. The VR worlds

produced by the unique objects generated in a 'VR art' frame are often oppositional for this reason, and challenge mainstream boundaries.

Conclusions

'You can't have all this and just write *games* software with it! It's obscene. Nobody over twenty-five ought to be allowed to handle technology. You don't understand what it's for.'

'It's for commercial interactive multi-user Virtual Reality games at the moment,' Valentine said grimly, 'and it's for paying my bills. There are worse games ... I know the alternative ... You start off with smart shells — and you end up with bolt-action rifles ... and the power and the medical supplies break down; and you won't be programming anything because the telephone network doesn't function, and the dark fibre cablenet has been blasted sky-high.'

Mary Gentle *Left to His Own Devices*

The initial idea for virtual reality that appealed to a lot of us was shared spaces ... Now ... I look at it and say, why did we ever want that? I think it's partially the nature of the technology but I think partially, and maybe primarily, we as a society haven't gotten used to it yet. So we're ... still wandering around going 'oh look, this is ga ga, you know. Boy this is really great. What do we do with it?'

Doug Faxon *Interview*

In a somewhat cynical vein, Mary Gentle here presents the choices of direction for making virtual reality systems as a choice between the commercial and the military sectors. What she also does however, is to point out the connections between local projects of VR production, their material infrastructure, and political struggle. Just as individuals position their skills in relation to material structures of production, they also position them discursively in relation to social and ideological structures of production. Gentle is pointing to the fact that technologies are politics by other means. Those politics are played out through the negotiation of technical frames across both local and globally dispersed economic, social and institutionalised modes of interaction.

Throughout this chapter I have argued that different technical frames produce a range of objects which are more or less standardised in different sites, and which gain their legitimacy from a number of institutional sources. Mass marketers, for example, often appeal to a language of universals to construct their products as popular art (see Traube, 1996: xix). Both formal and informal knowledges can be valorised and incorporated into aestheticising discourses to represent VR projects. The artefact becomes a solution when problems are found

for it - and the 'problems' of virtual systems building are variously described as interfacing with computers (the engineering frame), a reflexive aesthetic experience (an art framing) or the formation of community (in garage practices).

The 'solutions' to these 'problems' lie in the activities associated with building virtual technologies and worlds. The activities of programming, of engineering, of designing objects and putting them together out of other objects produce bodies and persons as well as objects - both the persons of the designers and producers, as well as those who consume the technologies. As the activities of any virtual body are entirely dependent on the technologies built and worlds programmed, any subjective experience of virtual realities relies on the available parameters set by the programmers, parameters which are culturally defined through the ways producers are positioned by discursive practices and interactions in local technology projects. Objects must be achieved: they must be made durable in social practice to have discursive and interrelational effects in communities other than those immediately within the VR industry.

Competing techniques and conventions are generated from different technical frames, and produce a range of objects. Furthermore, these ways of producing objects are drawn from both institutionalised skills bases and techniques, but also from the social and cultural means of organising human relations with machines. There therefore exists the possibility for hybrid objects, and hybrid skills and practices. There is a politics of subversion and marginality at work in some VR communities, but also a recognition in much of the work that individuals who build in different contexts can be both inside and outside the institutions which formalise boundaries between 'experts' and 'non-experts'.

This depends very much on the organisation of the technics, alongside business and the wider economic context, and how VR systems become durable in different contexts. I have examined the organisation of firms and industries here which affect the kind of objects produced. I have also addressed how these organisations draw boundaries around what is 'inside' and 'outside' the conventions of technical construction, and how technicians position themselves around these boundaries. In conclusion, I would like to reconsider how these processes of production meet with those of consumption, and the ways multiple connections among people, sites and stories may be understood.

Section Four

Building the Virtual

Conclusions

'Immersive virtual reality technologies' produce digital worlds which generate particular bodily and subjective effects. Similarly, the organisations which build these technologies, and the technical knowledges on which they draw, are also coordinated systems which produce effects — in the form of identities and practices, as well as technologies. Organisational networks can both enable and constrain technologies in particular directions of innovation and change, and are enacted in a field of contradictory relationships and locales of struggle. Understanding technical objects through productive networks of social organisation allows us to both challenge a dominant technological determinism, and to offer flexible and multi-layered/ multi-causal explanations for the form and effects of virtual reality technologies. Technological negotiation therefore becomes a problem of struggles for control over aspects of dispersed technical systems, and the legitimation and maintenance of them as socially conventional objects. The stories about virtual reality technologies that I was told as I investigated production sites,

and which I have related throughout this section, have demonstrated strongly that VR production is a thoroughly social process.

This section has considered how VR production practices are socially generated and maintained. The heterogeneous elements at work in virtual network building are accounting systems and silicon chips, marketing strategies, optical display devices and profit schedules, health and safety guidelines and tracking units, industry conferences and inter-organisational financing, as well as the labour of hundreds of people. The technology doesn't 'work' when any of these are 'dis-organised' — and the organisation doesn't 'work' if bits of the technologies are 'unstable'. Technical and organisational durability is achieved through economic and socio-cultural processes such as design, engineering, marketing, finance and public relations, to name a few.

Furthermore, these chapters have identified the social *effects* of VR production practices, which include technological objects, economic agreements, socio-cultural relationships and the subject positions which attend them. Different ways of organising production — such as entrepreneurial versus corporate alliances, building and marketing products to professionals rather than users, or working on an 'engineering' rather than 'art' project — all affect the ultimate form of technologies, the economic relationships defined and the subject positions produced by virtual reality production networks.

Examining the production of a *range* of VR systems demonstrates that virtual reality technologies are not only thoroughly social objects, but also thoroughly diverse, heterogeneous, and negotiated across both local and institutional contexts. The *similarities* between the sites are often an effect of already existing fields of institutionalised knowledge such as engineering disciplines, and established economic and organisational networks such as the graphics and/ or entertainment industries. Such relations of binary difference can consolidate a sense of identity in the VR industry. By drawing on shared cultural and inter-subjective frameworks such as production/ consumption, expert/ inexperienced, legitimate/ illegitimate, those in the industry can establish and maintain their difference from 'others', and often consolidate their human, cultural or knowledge capital. Because these networks are multiple and overlapping however, *differences* amongst groups and objects in VR technology production are also generated by these identity categories. Shared cultural assumptions, such as, art-sacred/ commercial-

profane, community-good/ corporate-bad organise understandings of relationships in the field in contrast and competition amongst themselves.

Organisational fields thus provide opportunities for both collaboration and conflict across which the local organisation of production is played out. While OSMOSE© and Virtuality® might therefore draw on relationships within the graphics industry, each are cross cut by differences between venture capital and corporate funding, which generate different local technology projects. 'Garage' projects such as Todd Zimmerman's gloves (Jacobson, 1994: 7) are situated across contradictory fields such as informal community organisation, capital funding, and the cultural credibility and symbolic capital assigned to 'invention' outside the boundaries of corporates.

The cases investigated in this research illustrate the uncertainties and contradictions presented by the multiple and overlapping social worlds and activities in virtual world production. Examples of these uncertainties include those faced by Virtuality® in unpredictable markets for their entertainment units, or the contradictions faced by OSMOSE© when their economic and cultural capital clash as Microsoft® enters 'art worlds'. Strategic responses to such uncertainties — the deployment of technical conventions or standards, the use of measurement devices to predict and control technical systems, establishing formal/ legal or informal contractual agreements — differ across the cases with respect to the milieu they face.

Moreover, these cases emphasise how diverse the management of economic organisation, social alliances and technical knowledge is across different sites. Individuals and technical communities strategically attempt to enlist 'others' to their definitions of social and technical relationships as these definitions are embodied/ scripted in their VR system. Through such conventions, whether technical or organisational, already existing and new relationships become durable. The investment IBM® make in a 'start-up' VR computing venture is one example of the expansion of their economic networks to the benefit of Virtuality®'s technical networks to maintain already institutionalised knowledge and research relationships in engineering and the computing industry.

Exploring the complexity of VR production across numerous sites presented a number of methodological and analytical dilemmas. The latter I addressed with recourse to actor-network and social constructionist approaches to technology building. These approaches facilitated movement across the 'macro' and 'micro' aspects of analysing production practices. In

the case of my methodology (addressed in the Methodological Section), the intention to explore a range of production sites demonstrated the usefulness of multi-sited methods. These methods allowed the flexibility to move across geographical sites and social groups, and to establish connections, similarities and differences between them. I want to address the particular methods and methodological dilemmas presented by multi-sited methodologies in the Methodology Section. Here, it is sufficient to note that such a multi-layered approach is a particularly useful tool with which to investigate questions about the forms and movement of power relations in technology production.

The differences and contradictions amongst VR systems examined in this research foreground issues of power. Sites and relations of VR production are necessarily imbued with relations of power, both because virtual reality technologies are embedded in already existing (economic, cultural and) social networks of control and regulation, but also because new objects, agreements and subject positions offer new opportunities to circulate control, hierarchy and discipline. For example, the technical practices deployed by those in an engineering frame include privileged understandings of self, world and power in which technical skills, knowledges and relations are embedded. This is also the case in an art frame, however. The more durable the artefacts, the more durable the networks of their making, so the more difficult they are to change. The bodies and technologies generated by production practices result in some shifting power relationships, but others that endure. OSMOSE© potentially opens new audiences and avenues of influence for Microsoft® corporation, just as a new venture funded organisation, Virtuality®, could have offered a location for the development of VR technology which was semi-independent of corporate control.

Asking political questions about virtual reality technologies involves asking how the world might become different: What if a range of technologies' 'others' were involved in design and production (as is the case in *Detour: Brain Deconstruction Ahead*)? What if technologists also became political philosophers (as I'm sure some of them are). What if technologies were widely recognised as social and cultural effects as they are social and cultural determinants? What if we could shift the configurations of technical production to foreground social and political heterogeneity? That is, to recognise that power is a matter of both being inside and outside the terms of the technical boundaries (Haraway, 1997; Star, 1995), in the same way that

VR is both 'real' and 'not-real', virtuality is both actual and real? (Deleuze, *Difference et Repetition*, 1968: pp. 169-176, in Lévy, 1998).

This counterfactual political practice involves being aware of heterogeneous 'weak ties' (Granovetter, 1992) in socio-technical networks, as well those which are strong. Several factors mitigate against such an awareness — such as enduring market inequalities, the knowledge-based and exclusive cultures which develop alongside technology capitalism, and the cultures of knowledge that emerge from common organisational and institutional commitments. This section has demonstrated, however, that the circulation and exchange of knowledge, value meaning and identity of the virtual is not limited to solely technical (or solely economic) practice, but is rather situated between sites of production (as well as consumption), and between economic, technical, social and cultural practices.

Engaging in a politics of positioning around virtual reality technologies involves moving beyond issues of 'access'. Control over aspects of technical production does highlight issues of 'access' — to knowledge and competencies and technical skills, to investment opportunities or input into standards or regulation in the VR industry — which are important questions to address. Equally important, however, are the politics of consumption, of meaning, and of embodiment. The knowledge and activities which provide an organisational field for VR production frame the virtual bodies and identities generated by processes of productive practice, and by participation in virtual systems. These bodies and identities are multiple, contextually constructed from necessarily diverse technologies, and are thereby also moments of struggle.

It is these struggles at the 'junctions of consumption' in virtual realities that are the central practices in what it means to 'become virtual' in the late twentieth century. It is to these *junctions*, to connections between sites and practices, that I now want to turn, in a reconsideration of what it might mean to 'become virtual'.

Revisioning the Virtual:

Conclusionary Remarks

The romantic era of virtual reality and network communications is already irretrievably in the past. The anarchistic, romantic, liberating, and critical potential associated with early cybercultural articulations, which boldly compared the emergence of virtual reality to the epoch-making breakthrough of Gutenberg's movable type, is now fairly exhausted and has largely been surpassed. Nowadays, virtual reality is a quite mundane technology, used as an attraction in theme parks, in scientific applications, and for military purposes ... [T]he new technologies of dominance ... have subtly permeated the new media and shaped the "traffic" on them.

Janez Strehovec *The Web as an Instrument of Power and a Realm of Freedom*

'Becoming virtual', it seems, is a contradictory process, and being virtual, a paradoxical state: 'The virtual' is contested terrain. The social practices associated with becoming virtual are nevertheless fundamental in a politics of embodiment and subjectivity as we encounter the twenty-first century. Digital mediation of many kinds increasingly inform experiences of the world, from representations of the Gulf War (Wark, 1994; Butler, 1992),¹ to the digital economy (Lévy, 1998), to social interaction in information webs (Wakeford, 1998). These digitally mediated social practices are simultaneously global and local, radical and mundane. Most crucially, they are practices which constitute the bodies and identities of contemporary western subjects as sites of political *struggle*. How social subjects are 'becoming virtual' relies not only on the technical, economic and cultural

networks which embed virtual systems in everyday life, but also how subjects deploy resources to produce practices and experiences which challenge and resist, as well as maintain, dominant categories of collectivity, differentiation and inequality.

Jacques Ellul (1990) suggests that western nations are under the influence of a 'technological bluff'. He does not refer to technique, as sets of practice, but to 'technology' which he argues is a discourse on technique (1990: xvi):

I am talking about the technological bluff, about the gigantic bluff in which discourse on techniques envelops us ... The bluff consists essentially of rearranging everything in terms of technical progress, which with prodigious diversification offers us in every direction such varied possibilities that we can imagine nothing else ... Discourse on technique is ... a demonstration of the prodigious power, diversity, success, universal application, and impeccability of techniques ... Technique is regarded in advance as the only solution to collective problems (unemployment, Third World misery, pollution, war) or individual problems (health, family life, even the meaning of life), and because at the same time it is seen as the only chance for progress and development in every society. There is a bluff here because the effective possibilities are multiplied a hundredfold in such discussions and the negative aspects are radically concealed.

While I remain wary of such totalising rhetoric, the potential for technical interventions in human bodies, identities and communities is considerable. I write this against an evening news program which reported military escalation in response to a breakdown in UN weapons negotiations, as well as featuring medical research which merged bovine and human cells. The potential coupling of virtual reality technologies with not only military and medical, but also with training, entertainment imaging and media technologies, opens new spaces for regulation, as well as spaces of political possibility. Such connections underline the need for a critical politics of 'the virtual' (Kendrick, 1996; Markley, 1996). A politics of virtual reality technologies maps the connections between objects, people and stories, and identifies fields of contestation around what counts as the human, the technological and the digital. Fields of resistance to dominant discourses of virtual subjectivity and practices of virtual embodiment need to be mapped, and the possibilities for a diverse, democratic and inclusive negotiation of these social relations — as well as constraints to those politics — need to be identified (Balsamo, 1996). Multiple material differences require complex political responses.

Digitally mediated social practices confound easy conceptualisation as 'cultural' or 'technical' practices, or as matters of 'structure' or of 'agency'.

Instead, they fundamentally challenge the theoretical categories and knowledge practices with which social critics have historically understood the technological regulation and discipline of populations (Foucault, 1973, 1979). Accordingly, in this research I have attempted to tell a number of *layered* stories in an effort to avoid the closure of either empirical or theoretical authority. These multiple stories have been about ‘becoming virtual’ as an embodied techno-social process: an emerging field of cultural narratives and metaphors, as well as a set of strategic economic and political practices. They have also been stories which reflect on how we *understand* the extensive yet intimate technologies which shape the lives of those in western worlds at the end of the millennium.

In Chapter One, I outlined questions which addressed the connections between virtual reality technologies and contemporary politics of embodiment and subjectivity (Balsamo, 1996; Kendrick, 1996). How do virtual systems maintain and disrupt dominant categories of techno-social experience? Who is becoming virtual, where, how, and what are the connections between them? How do they create contradictory moments where new configurations of embodiment, self and experience of (programmed and non-programmed) worlds might become possible?

In response to these questions I employed ethnographic research methods to identify connections amongst sites, stories, people and technical systems used in the production and consumption of virtual reality technologies (see Methodology Section). Ethnographic study enabled me to attend to a range of materials which spoke to how people are in the process of ‘becoming virtual’, including images and texts, talk and interactions. How people talk about what they do, and how they describe it, is an important starting point for discussions about how technologies are constructed out of social, cultural and political resources, as well as technical resources.

The layered stories associated with ethnographic work add complexity and sensitivity to a feminist social analysis of virtual systems. Such narratives offer a way in to the analytical tensions, connections and divergences between conceptions of virtual reality technologies as objects, and as media. As Mackay and Gillespie (1992) argue, the social studies of science and technology which address how technologies are designed, organised and used can usefully be extended by employing not only constructionist and network approaches, but bringing these together with cultural studies frameworks. In this project, those approaches included work drawn from feminist and

poststructuralist writing (Haraway, 1997; Balsamo, 1996; Hayles, 1996) to investigate the cultural logics of computer and communications technologies.

What has emerged is a map of bodies and identities who are positioned as sites of struggle in their various practices of virtual reality technologies (Balsamo, 1996). As Ellul (1990: 7) points out in the case of many contemporary technologies, becoming virtual involves (economic, technical and cultural) 'challenges, stakes and wagers'. By the same token, Cockburn (1992a: 45) argues that the dice are loaded. What challenges are relevant, for what groups of people, what risks they take in facing those challenges and the strategic allegiances they form amongst themselves constitutes a politics of virtual reality technologies. The representation of virtual bodies, the socio-cultural practices that virtual embodiment entails and the institutionalised fields which foster, deny or exclude some of their forms, are neither utopian nor dystopian myths. They are rather the distillation of disruptions to conventional notions of self and body at the close of the twentieth century (Gonzalez, 1995: 267).

Mapping the political processes of 'becoming virtual' has involved identifying a number of potential 'boundary crossings' made possible by virtual reality technologies, and the struggles that emerge around the definition of those boundaries (Stone, 1996). Identity, difference and embodiment, their practice and definition, are worked through various forms of inclusion and exclusion around virtual systems. Addressing these issues involves asking questions about how power is exercised in specific social contexts: the power of access to technologies, the powers of understanding and knowledge practices, and the powers associated with bodily and subjective regulation.

Difference and Identity

[I]t's about exchanges of power and staying on your toes and finding ways to subvert things to your own ends ... You know I've got short hair now and stuff but I'm still kind of a hippie renegade on the inside ... actually I'm growing up in many ways, but growing up doesn't necessarily mean selling out or giving up on ideals. Fighting systems that you think are oppressive, sometimes you have to accept certain realities, but that doesn't mean you can't still fight in your own way ... I think virtual worlds that I will design will in some way be manifestations of that sort of thing on an artistic basis.

Doug Faxon *Interview*

A central theme in debates about the social and subjective dimensions of virtual reality technologies has concerned the control and regulation of boundary markers which signify identity and difference in digitally mediated spaces. What kinds of virtual worlds and virtual bodies are being represented in digital spaces? What worlds and bodies are not represented? What do the physical artefacts signify through their form, and location in specific spaces? These questions address the cultural practices which attend virtual reality technologies, and the philosophy of dichotomous oppositions on which such cultural logics are found (Grosz, 1994).

How people are 'becoming virtual' in mundane spaces suggests that dominant forms of binary opposition are being reproduced in a number of ways. The relations which reproduce those oppositions variously include the potential actions of the characters in the genres and narratives of virtual worlds, the form of the images that comprise some of those worlds, relations between 'expert' and 'inexpert' groups, and the relations between producers, distributors and consumers in different locales. Examples of the (re)imposition of binary categories appear frequently in the locations of VR participation. They include images of heterosexual and gendered bodies from *The Lawnmower Man*, or 'generic' transcendental bodies from Dactyl Nightmare™ (see Chapter Three), as well as the construction of 'inside' and 'outside' knowledge communities (See Chapter Eight), and the producer/consumer dichotomy (see Chapters Five and Seven) as it is written into the technologies. Hierarchised distinctions between the real and the digital, the mind and the body, and associated categories of masculine and feminine, come into play (Hayles, 1996). As Massey (1996) notes, philosophical positions embedded in the presumption of binaries are not merely categories of thought but lived relations between social subjects and their (individual and collective) worlds. Ideals of disembodiment and transcendence, as a reaction to increasing economic, social and environmental crisis, are being lived in virtual reality technologies which privilege historically dominant terms – mind, masculinity, idealism. The products of techno-cultural boundary marking — gendered and transcendent digital bodies — are associated with cyberspatial experiences in logics of consumption (Shields, 1992). A related discourse of technical progress is expressed in the aesthetic design of the technical systems, and these discourses are symbolically consolidated in sites of use through the proliferation of media images and consumption spectacles.

Because we are always and inevitably embodied, digital bodies are at least in part *warranted* by the physical substance to which they are attached, and how that body acts.² Identities and bodily action related to binary categories of identity and difference are inscribed into digital substance, and reinscribed onto physical substance in the process of enacting virtual reality technologies. The politics of ‘warranting’ also becomes problematic in virtual reality technologies, however, and holds the potential to disrupt these binary categories (Stone, 1996). Digital embodiment makes possible the consumption of identities which need no longer be warranted through physical presence. Dominant categories of embodiment are therefore subject to playful transformation in the process of digitisation, which potentially shifts the configuration of power and knowledge in virtual worlds, as cultural agency becomes detached from any necessary location in a physical body.

Virtual reality technologies can be considered ‘agents’ which ‘mobilise’ certain human beings (Latour, 1992; see also Rachel, 1994) by virtue of their positions in discourses of technical progress, heroic/ competitive/ individuated selves, and the activities which attend these identities. The ethnographic material presented here suggests that what produces presence for the participants is the ongoing engagement of their physical body, and it continues to be the engagement of the physical body that provides the (albeit precarious and changing) ground for consumption in public space for participants (Hayles, 1996) (see Chapter Four).³ Similarly, as discussed in Chapters Five and Six, physical presence continues to provide the ground for economic/ organisational and technical identities and differences associated with the production as well as consumption of virtual systems (Schroeder, 1996).

The commodification of virtual experiences in relations of economic exchange runs material relations of value through the cultural meanings attributed to virtual reality systems in sites such as arcades, galleries and cafés. The discussion in Chapter Five indicated that while the exchange of commodities positions virtual reality systems and accompanying identities/ differences as items for consumption, it positions participants and staff in different ways in a range of sites. While participants can frame digital worlds off from ‘everyday life’ (de Certeau, 1984) and participate in them as exotic, ‘other’ worlds, they form part of the mundane working life of staff (Strehovec, 1998). The ambiguous position of staff described in Chapter Six underlines shifting *economic* identities of ‘self’ and ‘other’ amongst the groups which construct the locations of virtual systems’ use. Staff are

participants in virtual experiences, but they also organise the consumption of virtual reality, so are at times aligned with management and ownership of theme parks, galleries, arcades. The identities of those who own, organise or build VR, are sometimes allied, but sometimes incongruent with identities as VR participants. The bodies of consumers, technologists and business owners might sometimes be one and the same, at other times, they may be very different people with markedly different agendas. In both cases, however, strategies of resistance to the institutionalisation of VR as commodity consumption are possible in different locales. Both technologists and participants can resist taking up an identity as a commodity consumer by organising their building and participation in virtual worlds in ways other than through 'buying' or 'selling' VR. 'Garage' VR constitutes one such resistance to the commodification of virtual worlds.

Resistant discourses of identity and difference available in virtual worlds and communities — discourses of 'community' (however problematic), of connection, of knowledge as empowerment, of multiple selves and shifting techno-social allegiances — offer alternatives to idealist and transcendental versions of virtual embodiment (see Chapter Eight). What such a complex of discourses around virtual embodiment offers are material and metaphorical resources for a politics of body and identity. Like other media, virtual systems provide a cluster of resources — visualisation methods, connectivity, 'interface metaphors' imaginary realms — with which to imagine how the formation of identity and embodiment might be reworked through dispersed networks, through reflexive imaginaries of shifting boundaries. Virtual realities enable configurations of technics and identities that imply the possibility of *transformation*, of thoughtful and critical relation to self and to others. This is not inherent in the technologies themselves, but is invested in how such technologies are politically positioned. Resistant strategies are those with an awareness of the inequalities which inhere in already existing techno-social relations of identity and difference as they are played out in the realm of the virtual. These strategies of resistance to dominant means of regulating bodies and identities include the use of *strategic* alliances amongst political groups to stand in critical relation to the virtual systems that are currently being developed. At times, such resistances involves being strategic consumers of technologies, at others, strategic participants in knowledge-making about technologies. Such practices need to be coupled with an analysis that addresses the significant role of technical systems in disciplining and regulating human bodies.

Discipline and Regulation

[P]ower ... works not through prohibition and restraint of impulse but proliferatively, at the level of the *production* of 'bodies and their materiality, their forces, energies, sensations and pleasures' ... [This] ... conception of power does *not* entail that there are no dominant positions, social structures or ideologies emerging from the play of forces; the fact that power is not held by *anyone* does not entail that it is equally held by *all*. It is 'held' by no one; but people and groups *are* positioned differently within it. No one may control the rules of the game. But not all players on the field are equal.

Susan Bordo *Feminism, Foucault and the Politics of the Body*

The fantastic imagery of digital worlds tends to encourage utopian imaginings. The possibilities presented by virtual systems for the disruption of differences embedded in binary cultural logics is a rich source of political optimism. Such a political optimism cannot remain innocent to strategies of dominance, however. The extensions and consolidation of binary logics are not the only means through which dominant identities and forms of embodiment are secured, nor are the symbolic spectacles of consumption the only resources available to different groups to understand their (sometimes potential) relations to virtual systems (Valverde, 1991). Rather, people are positioned in relation to virtual reality technologies via an ongoing and phenomenal interaction with material, technical systems (Sofia, 1995; Star, 1991). Such relations enable the experience of digital worlds, they *make possible* the forms of representation, simulation and connectivity which produce 'presence'. They do so by extending bodily disciplines found in other instances of human-machine interaction which regulate the gestures, actions and habits of human bodies — such as exercise machines, technologies of government such as road rules, or the ways the products of medical visualisation technologies act upon bodies to inscribe particular forms of knowledge (Lyon, 1997; Bordo, 1993a; Sawicki, 1991; Foucault, 1979; Mauss, 1973). These interactions can also actively constrain the actions and interactions which can be enacted in digital worlds. The dominant form of presence produced in many virtual reality technologies is one in which agency and authority is warranted by an individualised and coherent self-as-subject who instrumentally acts in virtual worlds.

Alternative means of *practising* connections with virtual systems are available in worlds such as OSMOSE©. The practice of breath for navigation

in OSMOSE© illustrates the significance of embodied action in digital worlds, and further highlights how digital action connects with bodily action in non-programmed worlds. The connection between people and their digital forms of self are potentially precarious, and are therefore disciplined in social interactions across different sites. In art galleries such as those that have showed OSMOSE© and Placeholder, staff are experts and draw on their skills with the technics, and knowledge of the cultural and aesthetic sense of the work, to guide participants and instruct them in the ongoing use of the technologies. These sites employ a discourse of 'empowerment' — the communication of knowledge and skills to empower digital exploration — to frame such interactions. By contrast, while carrying out exactly the same work, the skills of staff in other sites are framed both by 'fun' and 'pleasure', and via an economic discourse which encourages the imposition of embodied practices which utilise disciplines of time (in order to expose as many people to connection with the machine as possible in a limited time frame of opening hours). The relations available in different sites indicates that virtual systems are technologies through which regulation is phenomenologically imposed, while at the same time *desire*, *self-discipline* and *self-governance* are essential if participants are to participate in virtual worlds, .

These actions expose the uneven workings of control across the sites of virtual worlds, and indicate the unpredictability with which virtual systems can render groups of people both empowered and disempowered by their 'subjection' to virtual technologies. In social worlds framed through technical knowledge/ power practices, those who have access to and knowledge about virtual systems can ostensibly render others subject to particular ideological and phenomenological formations through those practices (often in the form the machine itself takes) (Akrich, 1992). 'Users', however, have considerable interpretive and phenomenological flexibility (Cowan, 1987). These contradictions suggest a view of power as *productive* of selves, desires, practices and knowledges: and as dispersed through micronegotiations in networks of regulation. Terms such as 'structure' and 'agency' become problematic when desires, identities and categories of embodiment are conceptualised in terms of investments by actors within the variable freedoms and constraints of socio-technical networks. Subjects are positioned and thus disciplined by them, while at the same time constructing the socio-technical systems of which they are a part.

Ways of understanding the relationship between socio-cultural life and technologies — frameworks such as 'engineering' or 'art' frames — play a

large part in generating the desires and collective communities which encourage self-disciplinary work practices. Pleasure in the workings of technologies, and the desire to master technical systems are sometimes ends in themselves, but also serve the pleasures of community and connectivity to others when they are used to understand and manipulate communications technologies. These desires and investments are cross-cut by economic exchanges, and the discursive practices they entail. As (at least potential) commodity objects as well as technical systems, virtual reality technologies are embedded in networks of distributed economic practice and its organization (diMaggio, 1992; Nohria, 1992). Technologists as 'entrepreneurs' and business-people — whether in private enterprise or across public spheres — are disciplined by the requirements of the 'markets' they construct, the audiences to which they speak (see, for example, Traube, 1996). The means of organising the production and distribution of virtual systems positions technologists as self-regulating subjects with regard to their work, organisational and economic exchange practices. These interactions are flexible, but nevertheless deeply embedded in existing practices of economic exchange which benefit those who already have institutional access to social/ educational and cultural capital (Bourdieu, 1993).

Through their production, no less than in their consumption, virtual worlds can consolidate the formation of the self-disciplining gendered subject evident elsewhere (Bordo, 1993; Sawicki, 1991), and extend the self discipline of mundane and everyday non-programmed worlds into the digital realm. The self-discipline of those who build worlds gives them relatively greater access to the technical knowledges and mechanisms which generate virtual worlds than those of consumer participants. Part of the regulation of virtual worlds is therefore the degree to which the communities which generate virtual worlds encourage access to the means of constructing such technologies and the sharing of knowledge about them (Markley, 1996). This varies across socio-technical communities. On the one hand, some organisations such as VRASP, or public and moderated bulletin board communities, are centrally concerned with the extension of knowledge and skills in building virtual worlds, and in the dissemination of specific techniques in a common technical community through which techniques can be shared. 'Access' is not an event, but the formation of social contexts whereby opportunities to connect with elements of technical systems and specific social worlds are formed.

Issues of control and regulation in virtual systems open up questions about the politics of computer mediated communications and networking technologies more generally. More widespread access to the internet and the world wide web are related to virtual worlds as consumer communications technologies (Terry and Calvert, 1997; Mansell and Silverstone, 1996; Silverstone and Hirsch, 1992). In most cases, 'off-the-shelf' consumer technologies only encourage a limited understanding of how the systems work. They are 'black boxes'. This is not so problematic when the systems concerned have greater *functional* encoding (Mackay and Gillespie, 1992). When, like computers, the technological systems are *subjective* machines (Turkle, 1984), *symbolically* encoded to a significant degree with techniques which are potentially self-transforming, a rudimentary understanding of how they accomplish what they do becomes more crucial. To present alternatives to present practice, there must be some understanding of how those alternatives might be achieved. Often this is about local control, which is fixed in the form of objects, identities, categories of being. Dominant definitions of embodiment can be 'scripted into' the objects used, but these are simultaneously open to challenge. As the form of technologies shift, they can produce new relations, new configurations of power, and possibilities for alternatives to present practice.

The control of technological forms speaks to wider questions about the broad relations of 'technology' and 'society' — or rather what roles technologies play in our lives in a mundane way. How can we retain the techniques which address social and economic issues such as physical and mental health and well-being, our sustainable relations with our environments and our desires for growth, communion and positive change, without coming to rely on technological 'fixes' for invented problems? Is it possible to conduct a critical as well as a constructive discourse on technology? There are different kinds of 'access' to technologies, carrying different effects depending on whether one's 'access' is as a consumer or a producer of those technologies (Barry, 1996). The conditions which enable different kinds of 'access' for different kinds of people require us to ask questions of the networks which disseminate such technologies. What are the terms and stakes for the development of any particular technical network? What possibilities do they carry for regulation, as well as for freedom and possibility?

Feminisms/ Virtualities

The as-yet-undefined spaces in networks and computers are still there — even as they are pressed upon by commercialism and militarism, imbued with race, gender and class stratification, and containing frightening possibilities for surveillance. Nevertheless, this transition [to computing cultures] is also a possible occasion for reflection, a chance to quarrel with conservative definitions of human-ness and cognition, of work and of play. Because computers leak over the boundaries of organizations and the ways we organize our days, and because they are both medium and infrastructure for representations, they can also be fun, opening up and tools for change.

Susan Leigh Star *The Cultures of Computing*

Virtual systems are now becoming, if not mundane, then at least relatively familiar (Strehovec, 1998). Michael Heim (1998) has recently argued that as they have become more familiar, virtual systems have encountered a 'cyberspace backlash'. In *Virtual Realism* (1998: 36-39), Heim positions two 'camps'; the 'network idealists', up against what he calls 'naïve realists', the latter of whom are who are apparently 'Luddite'.⁴ What I find curious is the scholars positioned by these categories. It seems the list of authors he includes in the latter category are quite diverse in their analysis of virtual (and other information and communication) technologies. My reading also suggests that many of them seem to be sympathetic to, and have even been involved in, technical developments of communications technologies. The conclusion seems to be that anyone who asks any critical questions at all of virtual systems development is positioned as a 'naïve realist'.

It seems to me that some of the most important possibilities offered by virtual reality technologies are to interrogate not only the technical development of virtual systems, but how our bodies and our understandings of the world are embedded in that development. It would be ethically and politically irresponsible *not* to ask such questions and make such criticisms. Positioning diversity and dialogue would seem useful, and this research is, I hope a contribution to a careful public debate about what technologies 'we' want to see developed, and why.

Women have a significant role to play in asking such questions (Kramarae, 1995), and academic feminists have a role to play in offering informed analytical critique of technology development. Catherine Richards (1996) discusses the ways in which virtual reality technologies might challenge a normative sense of self and world, and such an evocative facility is important for imagining the transformations important to social movements (see also Squires, 1996). Both the subjective and material dimensions of political

struggles over selves and bodies have been crucial issues for feminism since the 1960s. 'Relegated' to being creatures of the body and emotion in dominant discourse (already problematic because of the physical 'boundaries' their bodies trouble; see Longhurst, 1994), women are further marginal by virtue of the liminal social positions and identities available to them as gendered beings in a society striated through gender difference. Women's bodies and subjectivities are in crucial ways sites of political struggle. Virtual systems are 'intimate' technologies of self and body, 'private' concerns, associated with the mundane and everyday, historically associated with women and domestic spheres (see Duncan, 1996).

At the same time, it is important to remember strategically that gender is a repressed process in virtual technologies and worlds, in so far as the workings of gender are rendered both invisible and marginal through the mechanisms of disembodiment in virtual worlds, and through the liberal discourses of 'equality of access' and 'community' in virtual communities. Furthermore, whether 'nattering on the net' (Spender, 1995), or immersively exploring digital worlds, women have tended thus far to have had a generally more marginal material relation to virtual systems than men (Hayles, 1996; Stone, 1996). Kramarae (1995) contends that this is both because of institutionalised relations whereby women are progressively excluded from technical knowledge-making worlds, and also in the gendered nature of the worlds being constructed.

It is crucial for feminists to explore how virtual systems offer potentially wider means of bodily controls, regulations and exclusions, even as they generate boundary crossing spaces in which women might well be expert. Such complexities require political strategies which focus on the productive and local operation of power (in, for example, entertainment sites), as well as how power is enabled through wider networks of relation — the ubiquitous discourses of technological progress, for example. Theoretical and political work which pays attention to language, meaning, and the ways they constitute selves and identities, is required in the analysis of 'technologies-of-self' such as virtual systems. These approaches recognise contradiction, ambiguity and multiplicity, and are cognisant of the shifting allegiances which evolve in critical politics (Haraway, 1990).

Focussing on 'the subjective', a site of struggle through which people are mobilised to 'diffuse' virtual systems, highlights the metaphorical possibilities of 'virtual worlds'. As Judith Squires (1996: 203) notes,

[w]here multimedia provided a visual metaphor for the concerns of multiculturalism, virtual reality offers metaphors wonderfully resonant for the theoretical concerns of poststructuralism. Regardless of their actual manifestations, these technological developments offer a new vocabulary for our political imagination, aiding the task of forging innovative political myths ... the development of cybernetics and virtual reality are of interest primarily as a source of resonant images and icons with which to construct radical philosophical and political visions.

Virtual systems are emergent practices, and what will be crucial in a politics of virtual realities as these technologies continue to emerge is reflexive and politically sophisticated research on the social and cultural dynamics which attend the processes of 'becoming virtual'. The ethnographic material presented here suggests productive arenas for the pursuit of such research. The contingency and multiplicity of stories about 'virtual' technologies — widely conceived — indicates that considerable complexity exists across different forms of technology. What new sites are developing where virtual systems meet different technologies such as television, medical imaging or telecommunications technologies? What new stories are emerging? What sociological and feminist stories can be told about virtual systems beyond those about selves and embodiment?

This research has indicated new directions for the analysis of virtual systems as multiple objects/ fields of study. In working with the tensions prompted by disparate approaches in feminist and poststructuralist theory, cultural studies, and science and technology studies, the research has indicated some points of meeting and divergence in these approaches to the study of virtual systems. A productive exploration of how unresolved tensions in these approaches might further interrogate each other in virtual systems research and beyond, is suggested by the connections established here.

How the logics (and techniques) of systems such as virtual reality technologies in entertainment resonate with other powerful imaging technologies such as those used in medicine is suggested by the connections I have mapped amongst a range of discourses in local social worlds. How discourses, technologies and normative practices become mobile across time and space, and how they become embedded in each other as new communications technologies develop, will be an ongoing issue in new computing and communications systems. This research revises ideas about how transformations in the technical worlds of virtual systems development and use take place, and the role of culture and social organisation in that process.

Some social situations make socio-technical transformation easier than others. The tasks for feminists, sociologists and critical cultural theorists as virtual systems emerge is to identify the locales of transformation, and to argue for public and collective/ community strategies of change in those locales. These sites include computing education, consumer activism, legal and economic change, and in widespread public debates about the kinds of virtual worlds and technologies that will facilitate participatory, equitable and liberatory techno-cultural practices. Where virtual reality technologies potentially rework selves, bodies and realities, it is possible to put the material diversity of non-programmed embodiment on the agenda in public discussions of technologies, and to discuss strategies of an inclusive negotiation of the terms of *both* programmed and non-programmed embodiment. It is important to keep asking ourselves who gets to define what technology 'is' and 'does' and on what basis? And how are human bodies and selves, identities and differences, thereby defined and redefined? In a participatory politics, these questions work towards the transformation of normative selves and repressive practices of embodiment in an emergent process of 'becoming virtual'.

THE EXPERIENCE THAT'S OUT OF THIS WORLD



Virtual Reality and 'The World'

Fig. 9-1
Virtual Reality and 'The World'
Virtuality (1993) back cover

Methodological Section

Studying the Virtual I:

Fields, Analysis and the Politics of Knowledge

[W]e seem somewhere in the midst of a shift away from the concept of an objective, knowable, factual world, “out there”, waiting to be found, and toward a concept of constructed worlds ... Here, knowledge is construed as contested and partial, an “effect of power” ... shaped by the interplay of language, power and meaning. Within this context, the “politics of interpretation”, the politics of knowing and being known take on urgency in our discourse about what it means to do social inquiry ...

Patti Lather *Deconstructing/ Deconstructive Enquiry*

[Multi-sited ethnography] is activism quite specific and circumstantial to the conditions of doing multi-sited research itself. It is a playing out in practice of the feminist slogan of the political as personal, but in this case it is the political as synonymous with the professional persona and, within the latter, what used to be discussed in a clinical way as the methodological.

George Marcus *Multi-Sited Ethnography*

This methodological chapter attempts to employ the reflexivity so central to multi-sited ethnographic studies to address issues of power in the construction of ‘research’, including the analytical agendas and processes upon which ‘knowledge’ is based. Just as the interplay of stories and physical materiality is an enduring theme in virtual worlds, here I want to address the

interplay of narratives, action and interaction, of lives and accounts of them in social research. The substantive issues of the thesis and the methodology are inextricably linked. This methodology is located at the conclusion of the thesis because a discussion of my methodological approach is also a discussion of the themes central to the analysis itself: the centrality of embodiment and subjectivity, the multiplicity of sites, locales and 'objects' of study, and multiple means of studying them.

As John Law (1992: 380) argues, knowledge is always embodied in a variety of material forms, no less in the research process than in other social worlds. Herein lie the politics of 'the field', played out through reciprocal processes of constructing 'worlds' to study, and identifying how participants construct a variety of social worlds in everyday life. The politics of constructing (and being constructed by) fields of study necessitated rethinking the relationships between methodology, methods, the personal and the political.

There were two things I found notable about the field of virtual reality as I initially began to carry out research. I realised soon after beginning the proposal for my research that 'virtual reality' is (both physically and culturally) a radically dispersed field of study, which requires a discontinuous, partial and situated methodology and analysis (Escobar, 1994). A loose 'isomorphism' emerged quite early in the research process between 'the field', and 'the methodology that might be employed to study it'. The second notable element of virtual reality technologies was that their mutable nature as simultaneously instruments, tools, media and symbol meant that any research about such social objects must be flexible enough to move across modes of analysis and disciplinary categories. These characteristics made the process of *constructing* a field of study obvious. Both factors underlined the need for a 'situated' methodological approach.

I initially drew on approaches such as the 'comparative case study' and 'extended case method' (Burawoy, 1991, 1998). The descriptions of these approaches 'fitted' elements of my project, but were incompatible with other concerns. It was only in the process of *doing* fieldwork, and reading, writing and theorising as simultaneous activities across time, that I began to *name* what I was doing. This chapter documents that process of constructing the field. The account draws out the pivotal roles of reflexivity, and attention to power relations and knowledge practices, which are central in my methodological and analytical approach.

It is certainly tempting to write the 'seamless' methodological text,¹ a text which allows no inconsistencies, and holds secure the closure of authority and knowledge so necessary for academic legitimisation.² Instead I have attempted to embed my project in scholarly traditions, in both sociology and elsewhere, which attend to local knowledge (see, for example, Duneier, 1992; Whyte, 1955), 'reflexivity' and specific 'situatedness' (Haraway, 1988). Ironically, those concepts that deconstruct the authority of academic texts can also serve to impose 'reflexivity' as a legitimising strategy.³ I retain, however, '[a] desire to make academic work incorporate its own criticism ... to register the limitations of any interpretive enterprise and the institutional forces that shape it' (Bernstein, 1992: 126-127).⁴

This is an attempt to highlight methodological difficulties and problems rather than deferring to 'authorities', and is in turn related to the deconstruction of claims to 'truth'. This strategy is employed because our accounts of the world do political *work* in struggles for legitimacy. As Bernstein (1992: 142) notes, '[w]hile subjectivity is not reducible to an intricate linguistic performance, the dimensions of language structure the representation of any epistemological claims about an 'I' simultaneously discursive, historical, and ideological.' The legitimacy of my arguments rests on their relevance to a feminist politics of diversity in the dissemination and institutionalisation of virtual technologies (Jones, 1992). I see this as a struggle for multiple access and politically partial and oppositional interests in the design, use and renegotiation of virtual technologies. How I negotiated the politics of knowledge throughout the processes of 'naming' and analysis provides the substance of this chapter.

The Politics of the 'Field': Power and the construction of 'objects' of study

"Fieldwork" *is* an activity, but it is possible now only as an always already existing construct ... Indeed, in "fieldwork" the signified is never infinitely postponed or deferred in that virtually no one engages in "fieldwork" with the idea that answers to "key questions" ... will never be found. While one's working hypothesis may change during the course of "fieldwork," the existence of an hypothesis suggests that the ethnographer is always already looking for something.

Roger Berger *From Text to (Field)work and Back Again*

Berger (1993) points out that social scientists both assume and construct their fields of study through their research practices. 'The Field' of research is not 'out there' waiting for researchers in some objective sense, to which they then apply their skills and knowledge (see Haraway, 1991; Harding, 1987). Rather, participants in particular social worlds *enact* a research 'field' in conjunction with the researcher in the research process (Bourdieu and Wacquant, 1992). The practices of *reciprocal* research relations construct 'fields' for research. The role of the researcher is to organise, accentuate, translate elements of the social worlds enacted by social actors. According to Bourdieu and Wacquant (1992: 227), '... the construction of an object ... is not something that is effected once and for all, with one stroke, through a sort of inaugural theoretical act.'

Lather (1991: 112) notes that this necessarily a political process. The object of the research gaze is contested, temporal and emergent (Clifford and Marcus, 1986: 18-19). As Bourdieu and Wacquant (1992: 244-255) argue, 'the question of the definition is at stake in the object itself ... the struggle over the legitimate definition, whose stake — the word definition says it — is the boundary, the frontiers, the *right of admission*, sometimes the *numerus clausus*, is a universal property of fields.' What 'the virtual' is, and how 'it' works, continues to be negotiated both 'in the field', and in the ongoing social practices that are unrepresentable in an account such as this.

My 'object' of study is therefore a multi-layered production, and its *naming* (in Lather's words, the 'productivity of language in objects of investigation' (1991: 111)) is produced both through theoretical reflection and encounters with social worlds. This was, initially, a process of asking questions, and in Chapter One I presented the questions with which I began, and which assumed/ suggested particular places, people and relationships as objects of study. The field was also progressively defined as an emerging process (Bromley and Shupe, 1980) through encounters with various social relations in the process of 'fieldwork', moving between sites, stories, groups and artefacts. The details of the methods employed in the course of fieldwork are discussed in 'Studying the Virtual II', the following chapter.

In addition to the fact that VR was a highly dispersed and multiple object of study, there were specific methodological commitments I wanted to address. I was specifically committed, for example, to situating the research as *feminist* research. The past ten years have seen considerable epistemological and methodological debate about what constitutes feminist research.⁵ I saw my project as asking about the interests at work in the

construction of technology, of thinking about how 'women',⁶ amongst and in relation to their 'others', negotiate their identities and bodies. I was interested particularly in how they might do so differently should western societies and cultures become re-organised in various ways through the use of 'virtual' technologies. I envisaged such research disrupting foundationalist assumptions about the connections between 'the real', 'objectivity', and knowledge of bodies and subjects (Harding, 1991; Grosz, 1988; Grosz and de Lepervanche, 1988; Harding, 1987). This is consistent with those who argue that research is 'feminist' (or allied with feminist concerns) when it is a challenge to orthodoxies of many kinds, asking questions about the interests at work in positing those foundations: 'for whose good' — 'cui bono'? (Haraway, 1990). According to Grosz (1988: 100), feminist research challenges foundational categories of social science research, because it is

neither subjective nor objective, neither relativist nor absolutist: it occupies the *middle ground* excluded by oppositional categories ... Absolutism and relativism both ignore the concrete functioning of power relations and the necessity of occupying a position ...

The charge of 'relativism' often follows epistemological accounts which trouble categorical boundaries — the charge being that 'relativist' accounts render all forms of knowledge equivalent to all other forms of knowledge. Lather (1991: 115) argues that this charge is an element of a 'cartesian obsession'. That is, it is '[t]o argue that it is an issue only within the context of foundationalist epistemologies which search for a privileged standpoint as the guarantee of certainty' (see also Harding, 1987). Between absolutism and relativism I would argue, like McDowell (1992: 413), is feminist research practice which is 'the construction of committed, passionate, positioned, partial but critical knowledge.'

To address these multiple concerns required a flexible and situated methodological approach, which could address an 'object' of study which was fundamentally multiple, which focused on the connections between institutional contexts, across a number of sites,⁷ and which moved beyond 'hardened' categories of 'local' and 'global' (Marcus, 1995), or 'social' and 'technical' (Latour, 1992).

Multi-Sited Ethnography

George Marcus (1995: 106) identifies 'multi-sited ethnography' as an emerging trend in social science research, which

define their objects of study through several different modes or techniques. These techniques might be understood as practices of construction through (pre-planned or opportunistic) movement and of tracing within different settings of a complex cultural phenomenon given an initial, baseline conceptual identity that turns out to be contingent and malleable as one traces it.

This approach seemed to develop an attitude to enquiry which combined participant observation methods pursued historically by interactionist sociologists such as the Chicago School (see, for example, Becker, 1963; Whyte, 1955) with the methodological insights of ethnographic methods in anthropology, and interdisciplinary science and technology studies.

'Multi-sited ethnography' therefore includes approaches such as 'actor network' analyses. Like the challenges to foundational enquiry in feminist and postcolonial critiques, these approaches describe an orientation to research rather than a specific approach. As Latour (1987: 4) argues in the case of science,

[t]he impossible task of opening the black box is made feasible (if not easy) by moving in time and space until one finds the controversial topic on which scientists and engineers are busy at work. This is the first decision we have to make: our entry into science and technology will be through the back door of science in the making, not through the more grandiose entrance of ready made science.

Approaches which focus on networks and connections are emerging in response to empirical social changes. The growth of far-reaching computer and communications networks such as the internet and world wide web, the growth of increasingly globalised economies, the development of characteristics of an 'information society' (see, for example, Castells, 1996, 1997a; Loader, 1997a; Webster, 1995) and the cultural disruptions such technical and social reorganisations prompt, require approaches which move across multiple sites.

My research both addresses and constructs complex objects of study across physical sites, conceptual boundaries and categories of social and cultural relationship. One way to distinguish such an approach is via comparison with other methods. This methodology can consist of elements of case

methods, elements of symbolic interaction, but can also have affinities with 'single-sited' feminist ethnography (see Skeggs, 1994). It is important, however, to distinguish 'multiple sites' from 'comparative cases' as units of analysis. If a 'case study' is a particular configuration of a unit of analysis (Sjoberg, Williams, Vaughan and Sjoberg, 1991), here the 'units of analysis' are both empirical and conceptual *connections*, and the ways these connections cross-cut each other, or are dispersed across locations. According to Marcus (1995: 96),

[ethnography] moves out from the single sites and local situations of conventional ethnographic research designs to examine the circulation of cultural meanings, objects and identities in diffuse time-space ... It develops ... a strategy or design of research that ... takes unexpected trajectories in tracing a cultural formation across and within multiple sites of activity ...

This attention to tracing cultural formations across sites with 'mobile' ethnographic methods seemed to address many of the challenges presented by virtual reality technologies as multiple objects of study, and allowed the flexibility to conceptualise the social relations of VR as having multiple locations, trajectories and cultural logics (Latour, 1987; Law, 1987). Virtual reality technologies seemed to be embedded in social worlds in ways that produced uneven and sometimes contradictory relations of power. As I was interested in mapping how these forms of power, and the subjectivities they produced, emerged from the meetings of bodies and VR, I was interested in employing strategies 'of quite literally following connections, associations, and putative relationships ...' (Marcus, 1995: 97).⁸ These strategies identify different kinds of links, what they consist of, and how they operate across sites.

The notion of following links began with the technology I myself tried in New Zealand. This system was made by Virtuality® Ltd., and I talked to some of the people that created this object, from the director of the firm, to the engineers and computer programmers who put hardware and software together, to those who produce and market particular games. I found out about other objects that the company produces, and how the games system I tried is connected to the research and development of a series of objects, the organisation and business plan of the company, and how markets are created and maintained. In following this object, I spent hours observing and interacting in location-based entertainment centres, cafés and bars, looking at the machines, how they were set up, and how people used them. I observed in

the environments where these interactions were situated, how the machines were displayed, and the strategies used in these sites to promote their use. I examined the kinds of texts generated to characterise the systems and the experiences available through them, and how people were positioned in relation to and as part of, the virtual system in these locations. I talked to people in the companies who owned and ran location-based entertainment centres about their experiences of the systems and the economic and organisational logistics of their institution.

I used a number of mapping strategies to systematically identify and follow these interrelated connections, gleaned from a number of multi-sited studies: strategies of following people, following objects and following metaphors and stories.⁹ In following objects designated as virtual reality technologies, I encountered various discourses and narratives about virtual reality technologies generated in the stories of participants, which led me to follow various groups of people who participated in virtual realities.¹⁰ In other words, as I began to see links amongst the sites and discourses associated with these objects, I moved through networks to other sites and discourses.

I used ethnographic methods to follow these links, methods which required both 'craft' and 'art' (Wolcott, 1995: 29), and which are discussed in the following chapter, 'Studying the Virtual II'. Reflection on the selection and technique of research methods is difficult. As Turner (1988: 108) puts it, 'I find a [site], get into it, and then I study it. Research ... has elements of craft about it, so that some of the knowledge acquired by those who do it is tacit knowledge, embedded in the skills of the craft, and it is sometimes difficult to be explicit about these skills ...'

In discussing how I carried out fieldwork, I find myself in the same slightly puzzled position that some of my participants at times occupied. There were moments in my research when I asked people to describe what they did: as in, 'how do you come up with a concept for a game?' Some people I interviewed immediately launched into a detailed task by task, concept-association by concept-association breakdown of what they did. Others simply looked a little bemused and insisted that they 'just kinda sat down at their desk/ computer and thought about it, and came up with a concept for a game.' Throughout this chapter and the next, I will attempt to articulate both my methods, and my methodological approach to research and analysis. In both cases, an awareness of power relations is a central strategy. According to Diane Wolf (1996: 2), one of the central dilemmas for feminists conducting contemporary enquiry is 'power and the unequal hierarchies or levels of

control that are often maintained, perpetuated, created, and re-created during and after field research' (Wolf, 1996: 2). These issues of power are as present in the process of analysis as they are in the construction of a field.

The Politics of Analysis: Power and the Construction of 'Research'

Entering the field, developing a place within the social order, talking, feeling and living in the setting, are the terrain of understanding the intersection of gender, self and others in fieldwork. Writing fieldnotes, writing essays, seeking and incorporating reviews and editing, are the terrain of understanding the web of data, self and discourse.

Carole Warren *Gender Issues in Field Research*

[T]his problem [of naming] is defined too narrowly as that of choosing a single word that will serve — making the decisions that seem politically or analytically correct, so as to forge ahead, armed with the proper concept. I would like to argue instead for a kind of strategic imprecision — that we ... should use several different labels more or less interchangeably, because each captures part of the reality that we are working to construct.

Marjorie De Vault *Women's Talk*

If the notion of multi-sited ethnographic methods provided a name for the process of constructing a field for research, the process of conceptualisation and analysis 'reads' that field within particular knowledge frameworks. Throughout this research, I have lost the last vestiges of my complacent undergraduate dream that an unproblematic, linear and predictable process of 'fieldwork', to 'analysis', to 'results', to 'writing' can be enacted. Simply by tradition in disciplinary craft I have written the methodological accounts presented here *as if* each section could be discrete, and as if there was a temporal and spatial continuity to the events to which this discussion relates. The analytical strategies described here were, however, constructed alongside all the other elements of the research process.

There were recurring considerations when approaching what might be termed the 'analysis' of my materials. I would describe my approach most often as an 'orientation' rather than a set of specific procedures. This project required (but was made no easier by) the generally 'voluminous, unstructured and unwieldy' materials which qualitative methods routinely produce (Bryman and Burgess, 1994: 11). Certainly, whenever I came to the end of an intense (if limited) fieldwork period, I found my environs suddenly inhabited by teetering piles of research materials, predominantly on paper,

with a few videotapes and usually some computer disks balanced precariously on top. It all looked a bit daunting, especially when faced with the process of 'analysis'. In accounts of qualitative research, 'analysis' is often taken for granted. Analysis is a craft skill, difficult to describe and delineate, and more difficult than quantitative methods to codify over time. The processes involved are very rarely rendered explicit,¹¹ although this is exactly the reason why practitioners should attempt to make their analytic procedures obvious.

It is an axiom of sociological methodology that the research strategies one adopts — as those explored in 'Studying the Virtual II' — will often affect the information available, and therefore the analysis one is able to make. The analysis is thus dependent upon the constraints imposed by one's methodological choices (Fine, 1996: 117), and analysis is intimately and irretrievably connected to the construction of 'the field', and modes of fieldwork. It is also, irretrievably and continuously connected to other aspects of the research process such as writing, theorising and reading. I find it impossible, therefore, to discuss the analysis of materials without finally reorganising such a notion.

As Potter and Wetherell note (1994: 53), the problem with talking about 'analysis' in qualitative methodology is that the very notion of 'analysis comes out of a discourse associated with quantitative, positivist methodologies such as surveys. Analysis in these settings consists in a distinct set of procedures.' They suggest that qualitative materials can't similarly be codified into 'aggregating scores' and 'categorising instances' in the same way. Qualitative analysis not only answers different questions to those posed by quantitative methodologies, but can also stand as a critique of such notions as validity and reliability, which come out of quantitative approaches to analysis.¹²

Throughout the time that I was conducting interviews and 'producing' textual and fieldwork materials (discussed in 'Studying the Virtual II'), I was simultaneously working through different analytical frameworks. One of my first tasks was to write narratives about the 'single' case that could be framed by a site or name, which could then be connected with others across their similarities and differences. In such a way, I began writing both descriptive and analytical vignettes as the research was carried out, and generating multiple accounts of the research materials. I put these together before switching my attention to generating the themes and categories which became the focus of my thesis. These vignettes provided a touchstone throughout the process of writing, however, and became one means of

retreating from the themes and connections amongst different communities and artefacts, to a consideration of accounts of specific situations.

My numerous efforts in analysis thereafter attempted to identify patterns, themes, points of difference and contradiction in the action and talk surrounding virtual reality technologies, as well as similarities across time and place in the sites of their production and consumption. I examined *how* stories were told as well as *what* stories were told, and I paid attention to both the *form* and the *content* of texts, images and objects. I tried to contextualise such stories in social worlds drawing on multiple conceptual themes.

In practice, the ongoing analysis of the materials I collected shifted between being informed by theoretical concerns, and the particularities of sites and materials, as the research sources accumulated (Becker, 1993; Thornton, 1993). Certainly in the initial stages of the project, a number of approaches influenced my choice of methodological strategies, which presupposed particular forms of analysis. These included a poststructuralist concern with how language generates or constructs social worlds and subjects, and a social constructionist and interactionist concern for action and interaction as productive of subjectivity and culture. Not only my research questions, but also my analytical choices, were informed by these conceptual tools.

I was not solely interested in generating material for its 'representativeness', nor simply through a concern to document a particular site or field. Rather, I was interested in theorising how a variety of technological forms produce, and are produced by, *diverse* worlds, subjects and bodies. This interest in theorising multiple research materials via multiple theoretical approaches led to a layered approach to analysis, 'grounded' at each stage by generating concepts through the words of participants and the objects and images also associated with virtual reality technologies.¹³ In order to identify concepts across research materials, and the conditions under which they operate, *many* instances of objects, stories/ metaphors and interaction needed to be addressed, at different moments, in different places, with different people. The cultures and social worlds of 'sites', and connections between them, represented the conditions in which the construct of 'virtual' operated.

In the very early phases of examining my materials, I did 'count instances' of words and phrases in interview texts, or the forms in images and technical systems. This provided me with an initial impression across interviews and fieldnotes where the same events, similar stories, similar words and meanings

were emerging. Having gleaned an awareness of the rhetorical importance of ‘transcendence’, for example, I looked for instances where ‘freedom’ was narrated, or where ideas about technical ‘progress’ were presented and reiterated. These themes were also generated from within the research materials. Before beginning the research, for example, I had little idea of the articulation of ‘community’ in various grassroots organisations of virtual reality technology development, but because of its frequent repetition in some interviews, I incorporated a consideration of this element of stories into the themes I began to generate. An orientation towards the *concentration* of meaning and action was important to establish. The repeated initial readings familiarised me (again) with the interview and fieldwork materials — from marketing videos to participants sketches and poems (see *Studying the Virtual II*) — and allowed me to reorient and ‘re-enter’ the field. Immersing myself in the data, I enjoyed reading it — over and over again!

I took notes throughout the process of observation, as well as through interviews. Such fieldnotes were later turned into a form of commentary note-taking to myself, not unlike Glaser and Strauss’ (1968) ‘theoretical memos’. I generated interpretations of statements or scenes based on specific theoretical approaches. I identified the rhetorics of transcendence easily and immediately, for example, both because my attention had been drawn to these issues by literature, and because it formed one term of a binary opposition familiar in feminist deconstructions of western philosophy. I also noted things that did not seem to ‘fit’, that I was confused about, that seemed contradictory. I could not initially imagine, for example how I might approach the question of the many different versions of the term ‘presence’ that I encountered, nor how I was to make sense of how the term was used differently across different groups of people and sites.

In addition to rereading and re-interpreting the fieldnotes and taking thematic notes on the interviews, I attempted to be conscientious about theorising as an activity that was an integral part of my ongoing life. When I began to work on generating research themes, I took to carrying around notebooks, which I hauled out in moments of inspiration (often when taking the bus home). Sometimes I scribbled notes on scrap pieces of paper available to hand which talked about the connections between concepts and particular incidences, or links between themes and sites. This informal theorising was as important as the more formalised approach to systematic thematic notes on the more readily identifiable research materials such as interviews or fieldnotes.

In the most general terms initially, I approached the material with a 'critical orientation' or focus (Potter and Wetherell, 1994: 50), attempting to draw on the sense-making procedures I had acquired when I first encountered these social worlds. I began looking for 'ideal' instances, instances which seemed to 'typify' a concept or theme, but soon also began to look for oddities and the unexpected, negative instances, or 'boundary crossing' instances. Images of boundary points between 'real' and 'digital' worlds, such as the half-'natural' half-digital image of a man in Chapter Seven, seemed to exemplify many of the codes which signalled transcendence of the material body. Other images were more contradictory, such as Don's drawing of 'doubled' figures, masculine and feminine, both 'real' and 'virtual'. According to Miles and Huberman (1994), searching deliberately for 'confirming and disconfirming', 'extreme or deviant', or 'typical' instances serves to increase confidence in the analysis (see also Riley, 1990).

While looking for thematic examples, I was also looking at differences within and between stories. I looked for points where the boundaries between classifications were drawn in a number of places, where a number of different words were used to describe or designate the same activities, objects, relationships, or where points of tension and contradiction lay. Several interviews constructed a growing and multiple picture of industry and community networks, for example, but also pointed to gaps or ambiguities in the material and conceptual links I was identifying. At other times, I encountered conceptual categories, such as those surrounding 'art' or 'artistic expression', which had a number of words, meanings and boundaries associated with it, boundaries that would shift with context. Furthermore, the role of different people and places in the construction of virtual reality technologies was at times ambiguous or contradictory, and participants seemed able to take multiple identities, and would sometimes narrate a number of selves both within and between interviews.

Subjecting events, texts and images to multiple readings across a range of conceptual agendas is not a process of 'triangulation' in which one can arrive at the 'truth', or one version of events which most closely conforms to a 'reality'. Rather, it is looking for points of convergence and/ or inconsistency and contradiction, to pinpoint those moments in which the struggle to make meaning, and construct social worlds, is taking place. Using variation as a lever was sometimes the single most important means of paying attention to how differences are made, and thus analysing how power moves throughout this social field.

Throughout this process of cumulatively reading and re-reading the research materials, I employed two particular techniques or strategies, derived from critical discourse analysis (see Van Dijk, 1993; Gavey, 1989; Potter and Wetherell, 1987) and narrative analysis (Lempert, 1994) respectively. The first of these was to concentrate on the *content* of the stories, whether these were descriptions of events, or narrations of life and self, and the clusters of words and meanings that are used to retrospectively represent, construct or make that story. In this way, I came to focus on particular words and phrases. One example is the use of the word 'community' in stories about informal groups of those interested in virtual reality technologies. Having identified this as a theme, I was able to associate it with other words which were positioned as 'different' in participant's talk — such as the notion of 'industry'. Having established these words in relation to each other in the logic of the narrative, I was able to consider how other terms, such as 'freedom' or 'choice' or 'margins' were associated with them in one particular narrative, and then extend this consideration to other texts. I further attempted to consider what other terms were *excluded* by selecting particular terms with which to convey meaning. In such ways, I attempted to identify where particular clusters of words and phrases were associated with each other, and how they were thematically connected.

The second technique is reading for *how* those stories are told — the *form* of the narrative, the selves or 'I' that narrative embodies at different times, the way metaphor or trope is used, the means by which participants put their language to use in power relations (Coffey and Atkinson, 1996). Narrative can reflect ways of telling stories that have a beginning, a middle, and an end, which position an 'I' in relation to others, and which draw on particular kinds of imagery and metaphor to relate their themes. Many participants (including myself in fieldnotes) used other bodily activities or situations as metaphors for their experiences of virtual worlds, for example. Furthermore, an 'I' — or sometimes a 'we' — is positioned in a text to convince the listener/ reader of the validity, and claim to (collectively sanctioned in the case of corporate bodies) truth, of the speaker's/ writer's account. Both of these techniques provide several different ways 'in' to the materials at hand, and different resources with which to treat the same materials.

In analysing a number of different materials, I sought the specific meanings of words, how the meanings of those words shifted in relation to different levels of sequences (in phrases, in sentences) and those formal elements in relation to each other. I looked specifically for the drawing of

boundaries, for the construction of categories of difference in those linguistic patterns. I looked for intertextuality — for the connections *between* texts, whether those were between different interviews with the same person, between interview texts and (for example) formal public relations releases or journal articles, between interviews with different individuals competing in the same social field. One striking example of intertextuality is in the iconic imagery of the head mounted displays, positioned against texts such as the ‘Borg’ in *Star Trek: The Next Generation*. I also looked for pronouns — I, you, we, they — as these indicated how individuals positioned themselves in relation to other groups, to texts, to artefacts. Throughout this process, the means to conceptualise what was happening was theory in its most ‘emergent’ state (Thornton, 1993).

The visual images I examined could be treated in much the same way with regard to meaning (Ball and Smith, 1992), although they were ‘secondary’, and so were abstracted (in the sense that they spoke not to socially constructed lives, but to the abstractions of cultural texts). It was here that a semiotic analysis was most valuable. I generated categories which paid attention to how binary and oppositional meanings are produced in (written or visual) language, how these categorical instances define frameworks for exclusionary or subordinating power relations, and to what social subjects they are directed. In the advertising videotapes I examined, for example, specific audiences (distributors) with specific concerns (the management of location-based entertainment centres) were identifiable audiences, positioned that way by rhetorical strategies employed by the manufacturing firms who produced the promotional tapes.

In one Virtuality® Ltd. advertising videotape, the construction of discourses of virtual reality technologies was apparent in the proposition of binary categories of being which would create, or not, exciting experiences for which customers would pay. ‘Digital’ being is clearly differentiated from ‘real’ being, and was articulated with an ‘inside’ and ‘outside’ of a digital world. A video image of a young man slowly walking towards a video game machine was constructed. The young man was in a warehouse, surrounded by static-filled television sets. The young man attempts to walk into the video game machine, but cannot get ‘inside’ the machine. Rapidly, the shot switches to an active and swiftly moving figure in a head mounted display, portrayed participating in a digital world. ‘Digital’ being is clearly ‘fun’, fast and exciting (hence valuable), ‘real’ being is clearly ‘not fun’, slow and boring (hence what the subject desires to escape).

In these ways whole sets of meaning are articulated together to produce defined 'subject positions' which are resources in ongoing struggles to sustain networks of dominance in meaning. Such an analysis draws implicitly on deconstructive techniques (see Grosz, 1990; Joan Scott, 1988) to identify where difference is deferred (*differance*) into other categories (the 'digital' into 'inside' into 'virtual'). These points of tension can provide opportunities for resistant understandings of self and power beyond singular oppositional strategies, towards identifying multiple meaning, multiple points of identification and resistance to the dominance of the primary term.

As I noted in Chapter Three, Valverde (1991) argues that there are ways of reading 'social' texts and identifying the 'subjects' of them that are specific to social science, and different therefore from ways of reading 'literary' texts. A structural approach to binary oppositions in literary or semiotic texts was sometimes useful when I was analysing pre-produced cultural texts such as advertisements or video footage. Valverde's (1991) understanding of lived social texts is, however, centred on multiple subjectivities, lying 'between' abstracted cultural texts and the lived realities of bodies. The 'subjects' of pre-produced cultural texts are abstract positions. In social analysis, those subject positions are (albeit variously) occupied by specific bodies who live and act in the world. My approach to interview texts therefore required a working conception of the 'subject' (see also Hollway, 1984, 1989) which did not assume a prior structural analysis of power and how it works through identity hierarchies.

In practice, this meant an open and critical orientation to texts as multiple self productions. When I found a coherent story of 'self' in elements of an individual's day-to-day life and events in it, I looked for other selves. I examined the contexts in which those multiple stories were enabled looking for consistency, and attempted to understand self-construction as an ongoing and unfinished 'project'. A poststructuralist analysis of oppositional categories of meaning is somewhat transformed in this treatment of biographical material. In this case, I was interested in attempting an analysis of the inimplicit binaries evident in the interview language, and a reading of that language as representing 'an embodied social world in which actors are relationally constructed and events and objects imbued with symbolic significance' (Fougere and du Plessis, 1995: 132, see also Nairn, 1998).

In pre-produced written texts, my orientation and approaches to making sense of research material included the deconstructive methods described above with regard to interview materials, as well as an eye to narrative

analysis. I attempted to cultivate a sensitivity to reading the detail of such texts for their rhetorical functions; how an account is put together in its rhetorical organisation, its structure, the use of particular evocative words (see Richardson, 1995).

By attending to *how* the story is related, narrative analysis seeks to uncover the multiple meanings that reflect the connections between an individual's life and problems and public, historical, social structures ... Because narrative analysis focuses on the "how" of lived experience and not the causal "why", analysis is framed interactionally... and attempts to unravel the multiple meanings that derive from interactional events while simultaneously seeking to examine the social text presented in the personal narrative (Lempert, 1994: 438 - 439).

Many of the pre-produced texts I encountered, such as advertising brochures or videos, were cast in rhetorically persuasive terms. As such they were attempts to ensure one perspective and undermine others (constructing one story as legitimate and justifiable, and others as illegitimate). Identifying those perspectives, especially contradictory instances in the same narrative, is important for defining the rhetorical power attributed such texts. I asked myself a number of questions in the case of such texts; how is one version designed to successfully compete with an alternative, how is it deployed in particular settings, in relation to other prevalent ideas, amongst the actions of particular groups, amongst a specific set of material resources? I was trying to establish how action and construction and variability are played out in talk/ discourse. According to Potter and Wetherell (1994: 48), '[p]eople perform actions of different kinds through their talk and writing, and they accomplish the nature of these actions partly through constructing their discourse out of a range of styles, linguistic resources and rhetorical devices' (see also Potter and Mulkay, 1985). Language is one set of resources that is used in heterogeneous networks to enrol others to a network building process, and to translate interests across different actors in that network.

Analytical memos, seminar and conference papers, writing fictional vignettes and narratives of objects or places, worked as 'stop-gap' analyses as I worked through the research process, and on into the process of 'formal' analysis and writing. This did not occur outside of the process of beginning to put together 'the thesis' as a coherently organised project. While I wrote papers throughout the course of the doctoral research, I began in the later stages of the project to re-problematise and reorganise the thesis in ways which prompted an ongoing re-conceptualisation of the research materials,

making connection between my fictions, my stories, and those of others. Each of these layerings of texts is a 'partial truth' (Clifford, 1986). Atkinson (1992: 9) argues that this layering process encompasses the later textualisation of research: the boundaries of the field are encompassed by a limited gaze, transacted into fieldnotes, transacted into texts, and transacted by the audience for it. The 'truths' thereby produced are constructed out of social processes which, in their entirety, are far more complex than an account of them could ever be. This is necessarily a 'reduction' of social life.

These processes of reducing and generalising gave pause for reflection on theoretical approaches as I analysed my field materials. The same process of 'transaction' was rehearsed three or four times, as I began writing drafts of the chapters. Marginal notes, numerous drafts of the chapter, and the notes of others (where the themes are consistent and not, where links are strong or weak, where arguments are, and are not, satisfactory) as feedback on my notes continued to contribute to the analysis. New questions, new interpretations, leads, links, connections emerged between material not only as I wrote, but as I also kept returning to the original transcripts and fieldnotes. As I returned to the original research materials and to earlier analytical and theoretical work again, and again, and again, there were questions which I could not pursue in the context of the thesis. How, for example, could I problematise the construction of 'race' in virtual worlds when it seemed that it operated wholly via absence and erasure, and my knowledge of the contexts of its construction were often limited? Similarly, as Hughes (1994) notes, some questions only emerge at the end of the research process. Some of the research problems opened up by my research and analysis are indicated in the conclusion to the thesis, 'Revisioning the Virtual'.

The layering of analytical texts is a process of 'putting questions to an emergent object of study whose contours, sites and relationships are not known beforehand, but are themselves a contribution of making an account ...' (Marcus, 1995: 102). These comparisons have shaped the stories and arguments which appear in this research account. While some reduction and 'distillation' is not only necessary, but inevitable, generalisations also emerge as connections are made across sites. Decisions must be taken as to how far generalisations can be made on the basis of the research materials gathered and presented. How far, for example, could I generalise about the process of constructing 'presence' in virtual reality technologies across many different technical objects?

As in a range of other qualitative research, generalisation in this account is theoretical rather than empirical.¹⁴ ‘Getting very close’ is a matter of generalising about the processes *common* to *dispersed* locations, while acknowledging difference and rupture. One of the most important questions becomes ‘how to produce an analysis which goes beyond the experience of the researcher while still granting [participants] full subjectivity. How do we explain the lives of others without violating their reality?’ (Acker et al., 1983, 429 in Lather, 1991: 74). Ultimately, it is important to remember that an interpretive account such as this, and the conclusions it reaches, are partial (Holland and Ramazanoglu, 1994), and therefore open to dispute. Furthermore, it is one moment of speculation in an ongoing process that has already shifted since my work in the field. An awareness of the politics of analysis and its accounting is central, as is the disruption of foundational grounds which might claim to ‘truth’ without reference to the lived experiences of many participants.

The Politics of Research Account Writing

It is certainly not the case in this research (if it ever is) that the ‘analysis’ occurred, and then the ‘writing up’: on the contrary. Throughout the dialectical processes of analysis, writing, gradually formulating arguments and drawing conclusions, the general themes which organise this research account emerged. The first of these is difference and contradiction amongst VR artefacts, experiences, and the contexts which produce multiple ways of defining reality and virtuality. Reality and virtuality come to mean different things for different players depending on their institutional locations, the relative power of those players to have others agree to their definitions, and the multiple sites to which they were attached. A second theme is the vectors of that difference —representational, phenomenological, organisational and institutional — and which trajectories are important in what circumstances for defining virtual subjectivity. A third theme was the similarities and consistencies in some of the discourses about VR which have already become widespread — and how they are attached to already familiar stories. These considerations became organising principles or propositions in the course of structuring my arguments.

Judith Aldridge (1993) argues that little attention has been paid in academic discourse to the process of research writing as a socially located

construction of *research* and *researcher*, as well as the 'objects' and 'subjects' of study (see also Lal, 1996; Cotterill and Letherby, 1993; Stanley and Wise, 1993). According to Aldridge (1993: 53), deconstructing the methodological and epistemological processes of research account writing — academic 'autobiographies'¹⁵ — entails attending to the producers, and processes of production, as well as the products of knowledge (see also Hobbs, 1993; May, 1993).¹⁶

Thus, how the researcher understands the research process is bound up with the products of that research — research texts — and how they are interpreted (see also Stanley, 1990: 120). This process deconstructs an assumed correspondence between research practice and research texts — the idea that textual research accounts hold correspondence with the (independent) 'reality' of research practices (Aldridge, 1993; Harrison and Lyon, 1993; Jones, 1992)¹⁷ which they purport to describe. Deconstructing the 'poetics' of sociological writing therefore consists of examining how sociologists accomplish 'the conventions whereby the texts themselves are constructed and interpreted' (Atkinson, 1990: 3). This refers to what is included and what is not, how words are shaped in rhetorical gestures, what techniques are used in their/ my texts as interpretive constructions rather than 'representations'.

I have attempted to keep deconstruction in mind throughout the construction of this research account, including the process of thinking about an assumed correspondence between the person of the researcher, their representations of themselves, and their researching and writing practices.¹⁸ Such a deconstruction includes critically examining the notion of a 'self' that exists prior to the research, and is unproblematically reflected in research accounts, even when personal or autobiographical (Aldridge, 1993; Jones, 1992). As feminist poststructuralists (and others) have pointed out, these constructions of knowledge are specifically, and inevitably, political projects (Lather, 1991).

I have therefore attempted to keep the potential uses of and audiences for this text in mind throughout its writing. While a correspondence cannot necessarily be drawn between my person, my research practices and this text, these are all implicated in an ongoing practice of knowledge production both within the academy and beyond it. As such, there are *connections* between 'my' self and 'my' text, even if those connections are multiple. Furthermore, there are connections between my text and its potential audiences. Those connections do political *work* and while I cannot, as 'Author' (Barthes, 1977),

impose a singular meaning on the reading of this text, as 'writer' I can express the hope that the political work these words do is work towards 'inclusive', responsible, accountable and liberatory technology practices.

Conclusions

Throughout this account, I have attempted to foreground the particular joys and frustrations of my research project as I struggled to find a name for my approach to researching virtual reality technologies. That 'the field' itself is globally dispersed contributed to some frustrations, while others emerged from the hard work involved in building an approach and argument. The joys of constructing the field, writing and analysis have been many, and are both personal and professional.

The unique aspects of this project, especially the 'virtual' aspects of research techniques and the development of an approach which contributes to an emerging body of (interdisciplinary) 'multi-sited' work, have prompted me to think in different ways about the form of social scientific enquiry, and the potential contributions of this research project to feminist and sociological research. Throughout this account, I have argued for the potential contributions of this approach to the production of anti-foundationalist and deconstructionist knowledge: attributes which are already drawn from, and might further contribute to feminist research in numerous ways.

If feminism is a perspective rather than a method (Reinharz, 1992), an orientation to or lens on the world (Fox Keller, 1985, in Lather, 1991), then when Susan Leigh Star describes feminism as (a) 'strategic heresey' (in Reinharz, 1992), she is articulating those moments of orientation to social worlds which are deliberately defiant of taken-for-granted, oppressive and marginalising knowledge and practices. As an anti-foundationalist project, this research seeks to produce 'deliberately defiant' knowledge about the construction of virtual technologies in western societies. Its aims are not just to strategically question dominant knowledge claims, but to identify how and where those knowledge claims are made and legitimised, how that might be changed, and points of diversity and resistance to dominating practices (see Weedon, 1987: 124). As such, this research is an instance of research in which feminism and postmodernism meet:

Within postmodernist feminism, language moves from representational to constitutive; binary logic implodes, and debates about “the real” shift from a radical constructivism to a discursively reflexive position which recognizes how our knowledge is mediated by the concepts and categories of our understanding ... [P]ostmodernism offers feminism opportunities to avoid dogmatism and the reductionism of single-cause analysis ... to produce knowledge from which to act, and to diffuse power as a means to take advantage of the range of mobile and transitory points of resistance inherent in the networks of power relations (Lather, 1991: 39).

Such knowledge practices require the ongoing development of, and reflection on, sensitive and flexible methods with which to gather research materials. It is to the fieldwork process in my own research, and my reflections on how I gathered my research materials, to which I now want to turn.

Studying the Virtual II:

Participants, Sites and the Politics of Fieldwork

[m]ulti-sited ethnography is constructed around chains, paths, threads, conjunctions, or juxtapositions of locations in which the ethnographer establishes some form of literal, physical presence, with an explicit, posited logic of association or connection among sites that in fact defines the argument of the ethnography.

George Marcus *Multi-Sited Ethnography*

Fieldwork is the creature of cultural limits and theoretical borders and, as such, necessarily is implicated in particular economies of truth, value and power.

Peter McLaren *Field Relations and the Discourse of the Other*

[Fieldwork is a] brash, awkward, hit-and-run encounter of one sensibility with others.

Nita Kumar *Friends, Brothers and Informants*

Whereas methodology and analysis are constructed in complex ways by knowledge practices, 'methods' are constructed through practices of embodiment as they are embedded in fieldwork. Anthropological and sociological reflections or memoirs on fieldwork reflect these practices of embodiment. They are replete with narrative imagery which attempts to capture the physicality and sensuality in experiences of fieldwork (Geertz, 1988). Identity, otherness and knowledge are written through the perceptions, feelings,

ebbs and flows of the body, and fieldwork is warranted through the researcher's physical presence.

The frame I bring to this discussion of 'methods' addresses precisely this embodiment of fieldwork. *Embodiment* was at the heart of, and the central paradox around which this research was enacted. The centrality of embodiment was paradoxical precisely because the research addresses the dis/embodiments of computing and communications networks. Despite the rhetoric I frequently encountered at the beginning of my fieldwork about global connection and communication, the field of virtual (computing, information and digital) technologies was not at all a 'digitally rendered' field. The most enduring and ironic paradoxes of my research was therefore a commonplace — the warranting of identity in a particular kind of physical body (Stone, 1996). That is, the irony lay in the fact that my initial attempts to contact people via email, and even sometimes by telephone, got me precisely nowhere. I was compelled to physically transport myself literally across continents to meet with people face to face *before* they would communicate with me as researcher via digital means. I found that almost without exception, the participants in my study would tell me the opposite was the case.

This occurrence in itself has been a valuable reflection on the circumstances which enable and constrain moves to incorporate digital relations into everyday life. These reflections, and a critical treatment of the methods used in the research, are the subject of this chapter.

A Research Project

My research took place in two major phases in 1995 and 1996. I began contacting people in/ from New Zealand about their involvement with virtual reality technologies at the beginning of 1995. I explored the world wide web, I read internet newsgroups on VR — 'sci-virtual-worlds' — and contacted overseas companies via email. I visited corporations investing in VR in New Zealand, as well as arcades and leisure centres. I 'hung out' and talked to staff and management, as well as those participating in virtual reality technologies in entertainment centres. I contacted programmers working on virtual reality technologies who were living and working in New Zealand. I read popular texts

on virtual reality technologies, collected advertisements, watched movies and television, read novels on VR and followed cyberpunk magazines. I used the telephone to request interviews, employed email in a similar fashion to establish personal networks, and physically turned up in public places such as theme parks. As Whyte (1984) comments, in ethnographic or participant observation work, the social exploration of unfamiliar territory is a fundamental element of beginning a research project - getting a 'feel' for the worlds in which you want to move. By geographical necessity, these endeavours constituted a kind of 'pilot study' in which gathering different kinds of research materials, and theorising about them, framed the ongoing conceptualisation of the research project. This cast the net wide, tracing initial contacts.

The bulk of the research was done later, having somewhat refined my sense of how the field was organised. I was tempted to keep following the one object I initially traced, but recognised finally that I really wanted to capture the diversity of a heterogeneous field. I wanted to see how a comparison amongst sites might work, and how the issues of similarity and difference amongst cases¹ might be played out.

In 1996, I shifted from New Zealand to Berkeley, California, and carried out similar research activities for a year in the San Francisco Bay area as the central period for gathering research materials. During my stay in the Bay Area I travelled to Europe for research, visiting several different locations in both England and Germany. On my return to the U.S.A., I spent time in VR locations in Boston and New York. There were multiple points of initial contact, 'real' (through personal contacts) and just as often 'virtual' (through email). Before I address the issues presented by the use of research methods, I would like first to address some of the issues around negotiating 'access'.²

'Access':

The politics of forming research networks

Negotiating access ... for the purposes of research is a game of chance, not of skill.

Buchanan, Boddy and McCalman *Getting In, Getting On, Getting Out, and Getting Back*

In the course of my research project, I attempted to negotiate access to a range of settings, for varying durations — anything from a few hours to a matter of days, or intermittent access over a period of weeks or months.³ When negotiating a place in participants' lives, the dilemmas of most concern were issues of 'positionality'; of relation of researcher to researched (Wolf, 1996: 2). Like Katz (1987) in *The Big Store*, I continue to wonder why any of these people gave of their time and energy to talk with me.

The issue of negotiating access highlighted the difficulties of *doing* multi-sited ethnography unacknowledged in Marcus' (1995) account. While multi-sited ethnography addressed some theoretical and conceptual problems regarding diversity and multiplicity in research fields, it simultaneously presents new problems. Of no small significance is the fact that, by virtue of conceptual and research design, the method entails following connections between sites and groups, thus requiring the ongoing negotiation of site access. The difficulties facing single-site ethnographers, such as the negotiation of access, are multiplied because they have to be addressed numerous times as the research moves across sites.

The negotiation of entry to the social worlds of 'others', of communities who are different (in multiple ways) from the researcher's everyday social worlds, is always a fraught process in feminist ethnographic fieldwork (Moore, 1994). The differences at issue in feminist research can include, but are not limited to, gender, ethnicity, class, sexuality, and ability. Such research relationships are fraught because of the assumption and negotiation of social power between individuals; the 'difference difference makes' (Nairn, 1998). Feminist literatures have also pointed to how power relations are negotiated in the ways researchers approach the communities they study and the process of establishing trust in the field.⁴ Such accounts often assume the researcher to be relatively powerful in relation to relatively powerless subjects of study (see, for example, Stanley and Wise, 1993; Stacey, 1988; Oakley, 1981),⁵ emphasising differences between researcher and researched at the expense of similarity.

While this focus on difference comes out of a postcolonial and deconstructivist critique of mainstream (predominantly) North American and European feminism, I found it methodologically problematic to focus on 'difference' to the exclusion of 'similarity' for a number of reasons. In my research, for example, the research process was most often a case of 'studying

up' (Ostrander, 1993), or at least 'studying across' axes of cultural and class differences. Many of the groups I was attempting to negotiate access to were 'élites', those whose status and relative social and cultural power were either potentially, or in practice, more extensive than my own.⁶

Negotiating access to these worlds presented particular kinds of problems for me, and underlined the contradictory and multiple character of my own changing positionality in the field. On the one hand, I was a relatively well educated, pakeha/white, middle class woman, whose social worlds — the academy, popular cultural participation, interest in computing — often overlapped with those in the field of virtual reality⁷ (see Alan Aldridge, 1993; Hoffman, 1980). When approaching potential field sites, I could present myself as a member of a western culture (down-playing aspects of New Zealand's South Pacific and colonial history), who could speak similar languages, both generally, and (at least some of) the language of the specialised computing field.⁸ In short, I was in many ways an 'insider'⁹ with respect to the cultures of production and consumption surrounding virtual reality technologies.

At the same time, I was in many ways an 'outsider' in this field (Collins, 1991). I was, for a significant part of the period in the field, living and working in countries other than my country of origin (although moving predominantly across nationality, culture and geography more than ethnicity). Similarly, I was approaching a field dominated by men (certainly in production, to a lesser extent in consumption), and at times I felt gender difference, and the inequalities associated with heterosexual relations of sexuality, very keenly (Warren, 1988; Fine, 1993).¹⁰ These different modes of being both an insider and an outsider intersected in different ways at different times, and worked both for and against me in the process of negotiating access to the multiple communities with whom I hoped to work.

On the one hand, in the realm of production, I wanted to participate in conversations with people in sites where issues around patents, copyrights and intellectual (both personal and technical) property were central concerns. Industrial espionage, and a culture of 'keeping secrets', was fuelled by sometimes intense competition in the computer industry more generally, and this spilled over into the community who produce virtual reality technologies (Kidder, 1981). I was often requested to sign non-disclosure agreements (and have not disclosed those details to which these agreements apply). Along with Thomas

(1993: 90), I decided that 'I would much rather know what I cannot say than to not know and then be forced to speculate.' More often, I was simply asked when my research was likely to be made public, time being a significant variable in the production of a 'shipped' product. There were several occasions where I approached firms only to be immediately rebuffed. In one of these firms, it was a matter of policy not to participate in 'research' as it might prove fraudulent.¹¹ In other cases, I had an initial meeting, only to be confronted with others' agendas. In one of these cases, there was an expectation that information shared with me would be 'paid for' via reciprocal 'information gathering' within the academic computing community in the university where I was studying,¹² a problematic proposition in communities whose relations are often structured through competition and patent issues. My position as an academic therefore worked for me in terms of status at times, but at other times could be seen as a threat.

Aspects of my positionality worked for me in other instances. My youth and (at times painfully obvious) naïvete about industry workings¹³ allowed me access to sites not extended to other, more experienced sociologists (Gurney, 1985, 1991; Warren, 1988; Hoffman, 1980). Being granted access under these circumstances is a 'backhanded compliment'. While 'access' was what I was interested in, entering into a relationship on those terms was to acknowledge that by virtue of my social positions as a woman, and as relatively young and unskilled in the worlds of computing and engineering, I had little status in the realm of VR production. I simply did not present any threat (Goffman, 1989).

In other sites such as entertainment venues, the issues were sometimes the reverse of those I encountered in firms and university computer laboratories. Presenting myself to computer scientists, engineers and entrepreneurs as an academic often gained me access to computing groups, as my research activities were legitimated to them via the institutional context to which 'we' belonged.¹⁴ In contexts of consumption though, presenting myself as a professional academic at times located me in an ambiguous position, as I was talking to a number of differently positioned groups in these sites. On the one hand, I needed to assure management that my access to these sites to observe and interview would not disrupt either the productive work of the staff, or 'consumption work' on the part of the 'punters'. At the same time, I sometimes worked quite hard to convince staff that I was interested in their work from the point of view of technology, rather than managerial efficiency. In another case, the interviews

with some consumers, negotiating on-site interviews 'on the fly' as people left the machine felt like a rather 'hit and miss' kind of enterprise.

Sometimes social research, especially research on entertainment, was misunderstood both as an activity and as a legitimate occupation. Often my endeavours were accepted sufficiently to gain me access when people could accept what I was doing as a kind of 'journalism'. At other times, the worth of such research was questioned (although the activities under study were never questioned as legitimate), and people sometimes thought that I was simply wasting their time. In some of these contexts my gender worked against me (as was discussed in Chapter Five with regard to the dominance of men in arcade sites), but my youth worked for me. It was not beyond the realms of possibility that someone of my age might be found in a video arcade, and I am within the generation which saw the introduction of the first video games.

The common theme throughout all these dilemmas was that access to sites was controlled by 'gatekeepers' of different sorts — that is, individuals who hold central positions in networks of social relations, and whose relational power in those networks is such that they can either make connection with other potential participants, and/or convince others of the relative value of the research project (Hunter, 1993). The gatekeepers I encountered held positions in networks with varying degrees of formality. On the one hand, access to firms was strongly controlled by the ownership and management of those firms, as numerous others in the organisational field have found before myself (see, for example, Bryman, 1988, Van Maanen, 1979a). On the other hand, the operation of informal gatekeepers is far more subtle than formal or hierarchical mechanisms, and involves fewer explicit social protocols, even in completely public places. Whereas it would be easy to assume that public places provide completely free access to anyone, in actual fact different forms of gatekeeping operate than those in formal organisations (and even formal access to organisations can encounter further blocks elsewhere in an organisation). Such mechanisms include the work of staff and customers in such spaces, their assumptions based on speech and appearance, or could be the spatial and temporal organisation of such sites (Karp, 1980). The issue of gaining access in public places confronted me again and again throughout my research.

This last point highlights an issue which emerged as fundamental in my research project: 'access' as an ongoing, present, embodied and continually

renegotiated process/ proposition. Sometimes the access I was allowed was specifically circumscribed by 'gatekeepers' such as entertainment site management (I was allowed to watch but not approach people for interviews, or I was allowed to interview but not take photographs). At other times, 'partial' access was endemic to the particular sites in which I was interested. For example, in some arcade sites I could not interview as the level of music was such that human voices were lost completely. As (Wolcott, 1995: 91) points out, access is always partial, and has to be continually done again throughout the duration of fieldwork. This was especially the case in multi-sited ethnography: access was therefore an ongoing achievement, continually challenged by the nature of the research which followed across connections, across organisations and groups. Negotiating access continued to be central in the 'methods' or techniques of gathering research materials, the substance of which I now want to address.

Methods:

The politics of maintaining interpersonal relationships.

[W]ould it be possible to produce ethnographic accounts of the multiplicity of practices linked to the new technologies in various social, regional, and ethnic settings? How do these practices relate to broader social issues such as the control of labour, the accumulation of capital, the organization of life-worlds, and the globalization of cultural production? ... Cyberculture is indeed creating a host of veritable "technologies of the self" that go beyond the view of self as machine, and the cultural productivity of these notions can only be assessed ethnographically.

Arturo Escobar *Welcome to Cyberia*

The key rationale for the particular methods I used is encapsulated in the above quote from Escobar (1994) — how to understand and analyse the experiences of virtual life in the late twentieth century, and the politics of such. My theoretical concerns with how subjectivity and power relations are generated through new communications technologies required a methodology that would facilitate the understanding and analysis of both processes of cultural meaning making, and methods to analyse material bodily practices (Kirby, 1997; Grosz, 1994). I therefore needed methods which facilitated the analysis of textuality and discourse, as well as aspects of bodily action and interaction.

Sociologists have often used ethnographic research methods, usually with a shorter duration in the field than those employed by anthropologists.¹⁵ Like many sociologists before me (Whyte, 1955; Becker, 1963; Fine, 1983, 1996), I employed multiple strategies of ethnographic information gathering, including participant observation, interviewing, and the collection of textual and/ or artefactual materials. Multiple sources of information ensured depth in the materials which describe particular individual sites, a depth which could easily be sacrificed when shifting across connections from one site to another.¹⁶

I collected a range of research materials from the diverse sites I visited, and in which I participated. I wrote fieldnotes from observational work and the informal, ongoing conversations I had with people in the field. I wrote descriptions of the places I visited and the people I met, and drew maps of the spaces in which they/we moved. I wrote fieldnotes about the taped interviews I conducted, and supplemented the transcriptions of those interviews with my journal notes and reflections. I fictionalised incidences, wrote small stories about people, events and my thinking about them. I watched (what sometimes seemed like endless) hours of movies and television programmes, making notes on the stories and the images produced. I read novels and short stories, anything at all with 'virtual' in the title.¹⁷ I spent hours sifting through still images, product advertising and industry newsletters.

In the following pages I focus on how the research strategies I used inform and reflect the central concerns of the thesis, insofar as power, subjectivity and positionality are central to the processes of fieldwork. In particular, I want to address how feminist ethnographic approaches have tended to look for more reciprocal, collective or collaborative strategies to minimise power differences in ethnographic relationships, and how this literature shaped my own practice.

Participating and Observing

Fieldwork does ... require one to be "there" — in the field — but [the] observation "Now that I was in the field, everything was fieldwork" notwithstanding, simply being in the field is not enough to make "everything" fieldwork.

Harry Wolcott *The Art of Fieldwork*

An important part of negotiating access to sites was giving potential participants (or at least particular gatekeepers) an outline of what I wanted to do once I had

permission to be in these spaces.¹⁸ Often, I described what I wanted to do as 'hanging out'. While accurate, and often used as a description of what is done in contemporary ethnographic literatures, this is not wholly indicative of the myriad activities I carried out while participating and observing in different social settings.

Sanday (1979: 20) describes the importance of the researcher as the primary research instrument in participant observation:

The ethnographer becomes part of the situation being studied in order to feel what it is like for the people in that situation ... Fieldworkers learn to use themselves as the principal and most reliable instrument of observation, selection, coordination and interpretation.

As Van Maanen (1979: 38) notes, 'this approach allows a fieldworker to use the culture of the setting (the socially acquired and shared knowledge available to the participants or members of the setting) to account for the observed patterns of human activity.' It allows for an approach which is 'person-specific', but not 'personal'. Participation in my research was therefore a matter of formulating strategies to become part of a social world/s (in a number of possible roles), and throughout the process, to become reflexive about that participation.¹⁹ Participation was therefore crucial to my understanding of my observations: the *appearance* of any social relations in and of themselves do not provide transparent meanings for those relations. My observations, initially selective, were progressively *theorised*, both via conceptual tools which informed the research design, and on the basis of the meaning attributed to social practices by those carrying them out.

This was combined with the conscious and strategic observation of others' (and my own) practices, talk about how they/ we experience or give meaning to those practices, and accounting for and theorising about that social world in fieldnotes. When I went into theme parks and arcades, manufacturing firms, conferences, public meetings and computer labs, I was participating in many of the activities appropriate to that place (although usually in a 'limited observer' role (Ely, 1991: 45)), looking at what others were doing, and talking with them about it.²⁰ In some contexts, I relied more heavily on observation, in others on participation.²¹

In all the places I visited, I attempted to consciously use techniques of observation strategically to generate accounts of the behaviours I was witnessing. These techniques included being clear and specific about what was seen and said, and making connections between those activities and cultural contexts. I also attempted to be aware of what I was not seeing; attempted to discern why my attention was drawn in particular directions; trying to keep in mind the specifics of what I was looking for. I tried to identify patterns, and monitor my own practices — what was I doing in that space, to what effect, and why (Wolcott, 1995; Ely, 1991).²² This last point draws on the work of Dorinne Kondo (1990), who talks about the consciousness of the 'Eye/I', and points to the ways that a consideration of positionality is integral to considering what occurs (and how it is interpreted as it happens).

Participant-observation problematises 'everyday worlds' (Smith, 1987). This institutional participation and observation is what links the consideration of the worlds and meanings generated by the participants as they live it with institutionalised discourses, and differences amongst people's relations to technical artefacts. This is also, therefore, partial and located knowledge. I want to argue, with Haraway (1991: 191-192), that

it is precisely in the politics and epistemology of partial perspectives that the possibility of sustained, rational, objective enquiry rests ... objectivity that privileges contestation, deconstruction, passionate construction, webbed connections, and hope for transformation of systems of knowledge and ways of seeing.

My purpose in using participant-observation was therefore to generate an account of the everyday worlds of those involved with virtual reality technologies. As the research progressed, I gained a clearer picture of what those worlds were, who inhabited them, and what the process of becoming virtual meant for them. I progressively conceptualised the relevant social worlds as those of engineers and computer programmers, of businesspeople, of consumers, of hobbyists, of retail staff and journalists. I could use my own experiences and accounts of my positionality to reflect on the construction of my everyday world in those communities in the workings of discourse, and social interaction. Goffman (1989: 125) casts this process thus:

Its ... subjecting yourself your own body and your own personality, and your own social situation, to the set of contingencies that play upon a set of individuals, so that you can physically and ecologically penetrate their circle of response to their social situation ... So that you are close to them while they are responding to what life does to them.

As Kondo (1986: 75) notes, in the field, the researcher *acts* (as observer, as participant), but in doing so is simultaneously *acted upon*.

My movement through the everyday worlds of those involved with VR meant that I encountered individuals who were particularly interested in my research (or with whom I formed a common social bond). Initially, I attempted to facilitate an ongoing relationship with many of the individuals I met. I learned early that VR communities are geographically dispersed, and I had no assurance that it would be *possible* to follow the connections between people and virtual reality technologies as far as I would like across space. Furthermore, as I was still meeting and building rapport in the earliest days in the field, I was still exploring, getting a sense of social ties, and had still to make myself a map of who was central, who was more peripheral in the relationship networks I was beginning to build.

In the end, three central individuals in particular became 'sponsors' in the industry (using the term 'sponsor' rather than 'key informant' to emphasise relations of reciprocity). Without their knowledge of relationships in the VR industry, and their willingness to spend extensive time with me, my research would simply not have had the breadth it did.²³ At the same time though, such sponsors also circumscribe potential relations in the field. The places, people and situations to which I had access were very much dependent upon their specific networks. Fortunately, the sponsors with whom I entered relations were particularly knowledgeable and 'well placed' within the VR industry.

The role of 'sponsors' in my research demonstrated some of the dilemmas of power that emerge from the closeness to or distance between the researcher and their 'others' in the field. Reinharz (1992: 65-71) maintains that the most central of these dilemmas for feminist researchers have been associated not only with issues of 'closeness and distance', but also with establishing and maintaining the roles of participant and observer, and with developing trust in the field.

While fieldwork requires a 'deep familiarity' (see van Manen, 1990), it was not always possible to maintain this. As I was moving across a number of sites, and constantly re-negotiating 'access' to different communities and groups

within and across sites, I was also constantly renegotiating the balance between being a participant and an observer (perhaps more than other ethnographers who concentrate predominantly on one site). These relationships changed both across sites and across time. As Marcus (1995: 112) notes,

in practice, multi-sited fieldwork is ... always conducted with a keen awareness of being within the landscape, and as the landscape changes across sites, the identity of the ethnographer requires renegotiation. Only in the writing of ethnography, as an effect of a particular mode of publication itself, is the privilege and authority of the anthropologist [sic] unambiguously reassumed ...

Throughout my time in the field I needed to acquire both technical and social competence (Fine, 1980: 117),²⁴ which initially restricted my role to that of observer. Being an observer was much easier in settings which were unfamiliar, but more difficult when I was observing activities or images that were part of my own everyday cultural landscape. I was an observer most in those sites where either my time in the field was not long enough to permit me to learn the requisite skills for the activities normally carried out there (such as software production). I was also an observer in those sites where activities would *allow* me to 'keep my eyes and ears open and my mouth shut' (Shaffir, Stebbins and Turowetz, 1980); a sometimes unusual social situation. Predominantly, I took notes 'in' the field at the time, more or less 'obtrusively', although my notes were often sketchy and later 'fleshed out' (what a wonderful metaphor!). Like Fine (1996) I saw no point in concealing the fact that I was doing research, and there were sites in which others, too, were taking notes — such as public meetings or conferences. At other times I wrote after the fact, on trains on the way home, at my desk in the evenings. In some sites I would declare that I was doing research, at other times I would merely attempt to blend in to the background and observe — and this was determined contextually through the site and those who lived and worked there. Whenever I engaged in conversation with anyone I would declare first that I was carrying out research. In any case, if anyone asked, I would declare what I was doing in that situation. I saw no point in dissembling (either methodologically or ethically).²⁵

Some feminists consider the 'gaze' of observation problematic, arguing that positioning oneself as an observer in research appeals to a generalised, abstracted and unlocatable knowledge (see Chapters Two and Seven for an outline of this critique). It is *participation* in a social setting that is often cast as

both methodologically and ethically more reflexive in ethnographic research. Participation has a significant political role in feminist ethnographic and qualitative research literature, and I took note of this body of work, even if it sometimes meant managing my own participation in the lives of people I didn't particularly like (Kleinman and Copp, 1993).

I participated most where the sites I visited overlapped with my more familiar cultural landscapes — as was the case in leisure centres, cafés or public meetings. On the one hand, I became aware in some circumstances of my power to intervene in and then represent others' lives in an ethnographic account. The quality of others' disclosures has, at times, made me aware of my dual roles. On the one hand I hold responsibility as a person (and, I hope, as an ethical researcher) to others in that social world. On the other hand, I hold responsibility as a researcher to remain faithful to my research project throughout its constant reformulation. Some feminists have said that they felt 'invasive' as participant observers because of this dual role (see, for example Reinharz, 1992).

These 'inherent' problems with participation, and resulting inequality in the researcher/researched relationship, prompts some feminists to argue that there can be no such thing as a 'feminist' ethnography (Stacey, 1988), and I struggled with these issues. There are a number of ways, for example, in which I constructed information about others for my own purposes across the research process, and in relation to my own interpretive modes of thinking. In this sense, no matter how collaborative the process, the responsibility for this ethnography must necessarily lie with myself (Geertz, 1988). Although I attempted to feed back materials to my participants over a period of time, both the methods of collection themselves, and the nature of the field, made this process problematic. Participants could not, for example, negotiate the fieldnotes I made about the events, conversations, spaces people and things that I encountered across the space of eighteen months of fieldwork. 'They' didn't see the (composite and sometimes fictional) vignettes that I wrote about them,²⁶ nor did they see my reflections on our conversations or interviews. In some cases, 'characters' emerged in the research from 'characters' I had met in the course of following lines of enquiry, but who were only part of the research for short periods of time: in some cases as short a time as fifteen minutes.²⁷

Such criticisms of the inherent problems in fieldwork often assume that feminist research is 'about' women whose social resources and power is not as great as those of the researcher (whether that researcher is a woman academic or not). In the case of my research, many of my subjects could draw on wider resources to generate their social power. I was unprepared for the effects of these field relations on myself as researcher. Primed by feminist and ethnographic texts about the potential to exploit one's participants, I didn't expect those occasions where participants were more than happy to contemplate taking advantage of a relationship based on research; such as attempts to use my services to gain access to others' 'work in progress'. This raises questions about pursuing reciprocal research relations, and the extent to which this can compromise a researcher's safety in the field (Gurney, 1991). It drew my attention to the dilemmas and ambiguities of reciprocity in the field. This raises the problem of trust as a two way street — what the researcher is doing to get the 'information' they want as 'hustlers' (Prus, 1980), as well as 'informants' using the relationship to get what *they* can. Ultimately, however, de Vault (1991) argues that ethnography remains a significant research practice, as the dilemma of power/ knowledge in these relationships can be utilised as a central methodological and theoretical resource in the analysis of research themes.

The interpersonal relationships here are difficult to manage. The extent to which one is participating with an informant as a friend, or participating and observing as a researcher, is a difficult boundary to manage on a day to day basis. As other observers have noted before myself, relations are always both, and the boundaries shift and change over time. Closeness and distance are both maintained, giving the researcher a dual responsibility, and dual obligation, and dual role. This was also often the case with interviewing in my research, which I now want to consider.

Interviewing

Scene:

A California late spring day, sunny and made hot by the glass walls of the conservatory on the first floor of the house. As neighbours, they had begun talking to each other when they realised they were both from the same side of the world. They formed a common bond of culture across a vast gulf of ocean. When they began talking, a sliver of fate passed over their conversation. Quite by accident it transpired that unbeknownst to either, they had each crossed several thousand miles

to become neighbours in the same street, and each was studying different aspects of the same technologies.

They had come to the conservatory for privacy, away from the bustle of the house, and were drinking tea as they talked about virtual reality in the drowsy heat. The conversation had turned to 'looking' and 'seeing' in virtual worlds. She said that one of the things she was interested in was how people see in different ways.

He talked about how interesting it was that people saw virtual worlds differently.

She asked him how he thought that was so.

He talked about perception, about light and refraction, of the means of creating a visual process in an individual's brain.

She had been thinking about culture, about how social relationships influence bodily experiences and realities.

Despite the sun and the tea, a fracture in language and in understanding opened a little.

One of my purposes in using participant observation, and in attempting to establish the relations which attend such methods, was to generate, work with, and work against in-depth interview materials. I conducted interviews with a number of different people in a wide range of places, from consumers, programmers and engineers, business people, artists and retail staff, who were found across cafés, entrepreneurial firms, themed entertainment centres, in media offices, in 'hobby' groups meetings and in their own living rooms.

These interviews produced different kinds of knowledge than the knowledge associated with participant observation: about lives (and the connections between them) more than worlds, about talk and understanding more than action (and thus the self-interpretation of such action), about themes and focus more than the messiness of daily lived reality. Interviews generated research materials which went through different processes of mediation. Rather than seeing-participating-writing, the research process was talking-listening-writing and rewriting. Rendering the words of participants in textual form allows for the repeated analysis of participants' words over time. What was distinctive about my research, was that at least some interviews were conducted via 'email'. This in itself highlights the sheer variety of interview methods that were generated by alternative forms of communication which did not rely on embodied location. Such conditions meant that I had to work very hard at all stages throughout the process to question and refine my strategies for accessing information about virtual reality technologies and the situations in which it is produced and consumed.

On the one hand, using ethnographic interviews allowed me to treat issues in a more detailed manner on a one-to-one basis with specific people. On the other

hand, it also provided a means to 'deepen' and layer a number of stories and activities *across* sites, to interrogate links across communities which are spatially and textually dispersed. Most importantly, it allowed space for those who live in and create the social worlds of virtual reality industries and communities to interpret aspects of their own lives and actions in their own words. The construction of their world and reality are the effects of both embodied discursive practices, and interaction. I wanted to find out what 'becoming virtual' meant for them, in the contexts of the ways they made their worlds.

The 'selection' of interviewees was based on their participation in the worlds I encountered throughout my observation. Firstly, I noted inclusion: who was central in these worlds, and what were they doing to create them? Necessarily then, I was noting both the insiders, and the outsiders to those worlds. My perception of who might be central changed over time as I attempted to follow connections, and people often gave me the names of others to contact. I often followed the contacts provided by my central sponsors, and thus interviewed people who were part of their social networks. In this case, I was interested in talking to those people whose knowledge of communities and industries would enhance in richness and detail, 'deepen' the material about the 'centres' of industry and communities I had gathered in participant observation. On the other hand, I often interviewed 'opportunistically', talking to people I encountered in sites who were involved in that world. I also attempted to note absences and invisibilities, as well as marginalities. These included people whose work enabled the production and consumption of virtual reality technologies, but who were considered peripheral in virtual reality communities (for example, the staff who were sometimes considered peripheral by management).

I had usually met the interviewees before the interview took place, because the interviews followed participant observation. Informal encounters in conversation with others were ongoing dialogues, which only sometimes led to more formal, in depth one-on-one interviews. Like the negotiation of access, dialogue and relationship in participant observation, the process of building interview relations was 'uneven' in my research. There were four different types of interview I used. The first was one-on-one conversations, conducted 'face to face', and which finally numbered twenty-five interviews. A second form of interview was one focus group session, in which four people participated, and one session with two people. I also used interview material that had been put

together by others, and released publicly, either in text or video form.²⁸ I occasionally did one to one interviews via email, which was halfway between a talk interview and a letter/ questionnaire. The latter two forms of interview will be discussed in the section on 'textual and secondary materials' below. Here, I am concerned primarily with face to face interviews with individuals or in the focus group.

Interviews that were 'face to face'²⁹ could take various forms, from ten to fifteen minute impromptu conversations (such as when consumers in sites such as arcades had recently finished participating), or one to three hours of intensive discussion (such as when I organised formal interviews with 'key players'). Invitations for interviews were predominantly extended on a personal basis after having met at a particular physical site, although sometimes I arranged interviews via email or by phone. The duration of most interviews was an hour and a half. The interviews were all transcribed and analysed.³⁰ Of the interviewees that were sponsors, three were interviewed twice. A total of twenty-seven people were interviewed. I attempted to follow links amongst people and groups as I began to interview. That is, I attempted to move amongst connections between people by asking those I interviewed if they could think of anyone else who I would benefit from meeting, or who would be willing to talk to me.

Where possible, I taped the interviews, as I was interested in how the language and the structure of narration positioned the individuals in relation to their worlds, their artefacts, and each other.³¹ As I discussed in the methodology chapter, 'Studying the Virtual I', I was interested in analysing both the content and the form of participant's stories, and thought that recording the interviews gave me constant and repeated access to the talk involved in those conversations. At times people asked me to turn the tape off, and I did so without hesitation, although where permission was given I took notes (I routinely asked interviewees whether they were comfortable with me taking notes). When I did take notes, I described the setting of the interview, noted impressions about the importance of particular points in the conversation, how the interviewees bodily actions interacted with their talk. Interviews predominantly relied on conversation and dialogue, although at times I also asked people to draw (for example, systems diagrams, or their impressions of what a digital world looked like).

Most of the interviews were 'semi-structured'. There were themes and issues in which I was interested, and these were articulated in my research questions. I was also interested in generating a dialogue in which participants could respond to those questions on their own terms, or generate alternative themes and issues that were of concern to them in their everyday worlds. I trusted that the issues that were important for interviewees were significant points of negotiation in the production and consumption of virtual reality technologies. I initially raised issues which seemed to be enduring amongst literature, commentary and interviews, to 'break the ice'. I also talked very generally about the interests that were central to my own research, orienting people my questions about how VR is 'produced' and 'consumed', how technologies shape practices of body and self and relation to others (and vice versa). I developed these themes in dialogue as interviews progressed. I progressively got better at identifying central issues, developing techniques to pursue them, identifying themes that had been raised in earlier interviews, and raising them in subsequent conversations. The degree of formality in the interviews depended on how well I knew those to whom I was talking, and the context of the interview.

Opportunities for discussion and dialogue of the kind I wanted to foster are not generally available through structured interviewing. In semi-structured interviewing, I could introduce new questions as the interview proceeded. One of the primary advantages of such clarification and discussion is that it produces diversity in research materials. This allows researchers to develop a range of questions appropriate to different contexts and different narratives. The value of access to people's ideas, thoughts and memories in their own words cannot be underestimated. In such a process I found multiple (and sometimes contradictory) voices in the same body, talking not only about the cognitive and discursive categories with which they order their experiences, but also about those experiences as tactile, sensory moments.

Further voices became apparent when I interviewed people in pairs or groups, rather than in one to one interviews. The focus group interview was the product of an opportunity to speak to a group of consumers. They used this social occasion to 'play off' one against the other, remind each other of ways of virtual being and doing, play to each others' experiences. In these circumstances, each individual interacted with the others, as well as producing their own stories. This meant not only that there was some discussion of events and issues between

participants (so that those events and issues could be described from a number of points of view), but also that the dynamics of the interview generated materials about how collective dialogues on virtual reality technologies are produced. I wanted to examine the 'interactive' production of those experiences through the processes of negotiation, agreement and disagreement. Small group interviews thus emphasise the *performative* aspects of narrating the virtual life.

The problematic elements of the process were dilemmas both of dialogue, about how research interviewing is a process of formulating power relations, and about positionality, about identifications and differences between myself and those with whom I had conversations. For example, in a male dominated field, the most trenchant and significant difference for me in interviewing was that of gender. Overwhelmingly, those I was talking to were men (see Elizabeth, 1997; Lee, 1997; Stanko, 1994; Armstrong 1993; Layland, 1990; see also Kelly, Burton and Regan, 1994). Increasingly, feminist scholars indicate that interviewing men presents particular methodological problems (Lee, 1997; Ribbens, 1989), not least of which is the negotiation of gendered power relations. In my research, the issue I found most personally difficult (but, I suspect, theoretically productive) was some men's unexamined assumption of their right to determine the form and subject of our discussion. At times, the only strategy left open to me in an interview situation was a formalised re-assumption of a researcher role, and a redirection towards the themes in which I was interested.

Only occasionally was I faced with situations that rendered me very uncomfortable, and very conscious of gender dynamics (Ribbens, 1989). Twice men indicated their interest in an intimate relationship.³² On one other occasion, at a conference where I was participating, I accompanied one man to the 'trade hall' at the conference. We were both trying VR gear that was being shown at the conference. He informed his acquaintance who was manning the booth that I was a 'virgin' (a popular VR in-joke in the Virtual Reality in Education (VeRgE) group, which refers to both members of the group, and first time VR users, as 'VeRgEans'), a sexualised and highly gendered term. In these cases, I was made aware more than ever of the centrality of bodies and embodiment in shaping the interview encounter, and the knowledge produced from it.

At the same time, interviewing a range of men allowed me access to diverse men and masculinities at work in the field of virtual technologies, and thus a diverse group of people with whom I could negotiate commonalities and

differences. I encountered men in a range of professional and socio-economic positions, from intellectuals and artists, to entrepreneurs in business, to those who spend their leisure time in arcades, to students, to retail workers. Although dynamics of gender were, at times, explicitly negotiated, the same could not be said for 'race' or ethnicity. Overwhelmingly, those I spoke to were 'white' (see Phoenix, 1994), none raised the issue of 'race' as problematic in virtual reality technologies, and the presence of my body allowed both interviewees and myself to assume similarity rather than difference (see Bailey, 1996).³³

Throughout my participation and observation in the field, and my thinking about those whom I might interview, I sought out women who were willing to participate in the research. I organised interviews with these participants, possibly with almost unseemly relief, at times! My reflections on the interview process prompted me to evaluate how the interviews were similar, or different, depending on whether I was talking to women or men (Reinharz, 1992). Certainly, in mixed focus group, the men tended to take up more conversational space than the women. In one to one interviews, similarity or difference in gender between myself and participants, or amongst interview participants, didn't seem to affect the kinds of issues discussed in the interview until women identified their own gendering in the field as problematic. At this point the talk often changed to consider gender as a specific dynamic in VR. Men tended to ignore gender as an issue in VR technologies. Some dismissed its effects outright. It was when women acknowledged gender as something which affected their interaction with technologies that they began to rely on me a source of affirmation for their experiences. In doing so they often assumed shared experiences between us. Some professional women shared comments in confidence, in a one to one private context, that they did not share in mixed groups in professional contexts where men were present.

Cultural factors intervened in the interview situation as well, particularly differences which I identified when talking to people from North America. Earlier, I discussed how access was difficult in those cases where suspicion for strangers stemming from patent issues was a factor in social relations. I encountered the same suspicion with recording devices in interviewing. On the one hand, those from North America were more familiar with my little (mostly unobtrusive) tape recorder, and more comfortable having it running throughout the interview. Those from Europe and Australasia were less comfortable, and

more likely to become self-conscious. On the other hand, those from North America were also more likely to request the tape be turned off at certain moments, and more likely to be aware of the potential litigation which could be brought personally against them as a result of their comments. In different interviews I was managing the role of 'trustworthy confidante' in different ways.

When I was interviewing 'élites', being trustworthy meant accommodating their activities and timetables (Thomas, 1993), and I was in the position of interviewing wherever and whenever it was most convenient for those being interviewed. I therefore held conversations in cafés, in cars on the freeway, in homes, at their offices, in conference rooms. My ability to dictate where the interviews took place reflected, sometimes in very straightforward ways, my subordinate power in relation to those I interviewed (or so I thought in my most cynical moments). At the same time, I was doing very short interviews with consumers when they got off the machines in the arcades. As an opportunistic strategy, this might have meant it was difficult for them to refuse an interview. While I gave people the opportunity to walk away, their resistance was more often expressed in terms of one word answers than the removal of their physical presence. These simple dynamics, as much as any others, brought home to me my social positions and changing relation to those I studied, and of the need for 'humility' in research (Goffman, 1989).

My struggles with the assumption by others of gendered power in interviewing, and my troubled reflections on my assumption of power as researcher in arcades, has led me to reflect on how the processes of dialogue in the interview form produce relations of power. According to some feminist scholars (see, for example, Oakley, 1981), one of the most significant forms of power relation to arise out of the dynamics of interviewing is the relative power of each participant to define and name what the research is about. According to Oakley (1981), such power includes the power to define the form the interview will take, and the content of the account. Oakley (1981) has argued that interviewing women is a 'contradiction in terms' as the process is a 'masculine paradigm' in its rationalism, non-involvement, and 'objectivity', subordinating interviewee's versions of how they live their worlds. At the same time, however, there is the question of *how* participants construct those accounts as a source of research materials. This point acknowledges the productive role of language in generating narratives of lives and identities, and subverts a struggle for 'truth

claims' between 'whose version' — the researcher's or the participants' — is closer to that ultimately grounded truth or reality (Holland and Ramazanoglu, 1994). The interview itself is another social situation in which language is utilised to construct a version of lives and events as they are lived, both through discourse and through practice. The issue is to look also to the contexts of that narrative, as it is situated in discourse, and to discuss that contextualising process.

Certainly, in my research, there were moments when the relative power to control a situation, and to define what was happening was of concern to me, and I was aware of speaking to people with little chance of negotiation or feedback. On the other hand, the dominance of the discourses spoken by participants to shape the questions of interest is likely to have as much power, both in the dynamic of interviews to define an agenda, and in an account of the field such as this.

Specific issues arose when I conducted interviews via email, rather than through face to face spoken methods. On the one hand, email has the spontaneity and immediacy of talk, but the textual qualities of print media, with its possibilities both for editing and for printing repeatedly. The problems with such methods are several. Firstly, it excludes the conversational dynamic — the responses of the researcher, the visual, physical clues of bodily presence, as rendered in fieldnotes — from the interpretation of the interview materials. An individual is decontextualised from their social context and milieu, and becomes an abstracted presence. The meanings that are built in dialogue, then, as part of the research process, are missing. A second problem is an ontological one, and consists of the difficulties of attaching that abstracted text to a physical body. The degree to which words can be attributed to particular bodies becomes problematic, as does the ethics and politics of using such words as if intentions accrued to them outside their own articulation. In this case, the text completely becomes one without an 'Author' (Barthes, 1977). Of all the research materials, these are the most directly 'disembodied'.

The last issue of 'dialogue' to become problematic was what to include in this research account itself. I had sent back copies of the interviews, as promised, to those who participated in them. At times, though, it was difficult — in some cases impossible — to trace individuals who had participated in the research. Attempting to trace individuals and companies, to feed material back to them,

was an important component of the research, and at the same time ironically served to generate more research materials. It demonstrated how strong or how tenuous the links were within the industry, both organisationally, and between different elements of the industry. While at times I have used material I have not specifically negotiated with participants (as I was not able to contact them), I have assumed consent from initial participation in the interview, at which they were given information about how that interview material might be used in the research account. I have done my best to think sensitively and ethically about the appropriate use of such materials.

In the interviews, people shared personal details with me (and I with them), mostly about work, but at other times about their personal lives. This was especially problematic where such accounts included material about, for example, conflict in the industry, or relations between specific people. At times it was questionable as to whether I should include this material, and my decision for the most part has been to omit such details. Even if potentially, as Stacey (1988, 113) notes, everything becomes ‘grist for the ethnographic mill’ this doesn’t mean that everything needs to be shared in a research report. What happens in the field shapes the researcher, and knowledge of those events goes in even if they aren’t spelt out as specific events in the writing. As with participant observation, sometimes its easier for people to talk with someone outside their everyday worlds. ‘Turning the tape off’ facilitated particular kinds of talk, in the same ways that email as ‘virtual’ talk facilitates alternatives to interaction with physical presence. Such talk, as personal relations, were not a problem, but the source not only of ‘data’, but also of exchange which emerged from dialogue — a very different basis for generating analytical materials than other forms of textual data which I used.

Textual Data

Interviews are ultimately textual data, as they are transcribed, edited, arranged and rearranged throughout a research account. Just as the interview transcriptions were texts of the printed word which could be subjected to textual analysis, I collected other documentary data for analysis. These data primarily took the form of printed documents, although at times they also took digital

form. On occasions these documentary sources supplemented the participant observation work and interviewing that I had done, at other times documentary sources provided significant primary analytical material.

The former situation was obvious where I collected secondary source interviews of people that I had met and talked to in the field, or others with whom I was unable to obtain interviews. These interviews were both in public printed form in newspapers, magazines or journal articles, and in the form of video documentary interviews (Davies, 1995a). More rarely, I have drawn (indirectly) on interview excerpts from multimedia 'quicktime' clips (Hershman Leeson, 1996). These further sources supplemented the material from my primary interviews and added depth (the advantages of having participants who are media-trained and in the limelight), and the interpretive work I was carrying out with those primary interviews. At the same time, I could collect documentary sources of descriptions of events and products which provided further resources for analysing those events and technologies, at times from different perspectives than those extended by my interview participants.

Of particular interest were Bulletin Board discussions about virtual reality technologies. Bulletin Boards, a form of Electronic communication on internet and usenet, provide a means of communication much like their 'physical' precursors: participants 'post' messages on the 'board', to which others can reply, and an ongoing dialogue can emerge — called a 'thread'. These bulletin boards served several purposes in my research. On the one hand, they provided valuable information about the release of products, changes in companies and resource centres, and gave notice of public meetings. At the same time, they provided a kind of 'buy sell and exchange' mart for hobbyists, and so mapped the circulation of both goods and skills in that community (new and second hand products, and job advertisements). Finally, these bulletin boards provided an ongoing forum to discuss any issues which that community considered relevant — and so (several simultaneous) discussions would meander their way around technology evaluations, the philosophical implications of mind/ body relations in VR, requests for assistance in patching together seemingly incompatible componentry, requests for information/ bibliographic sources, or debates around the psychology of phobias or disorders which might be 'treated' with virtual reality technologies. These discussions were a useful map of central points of cultural tension in VR communities. I have not used these materials directly

(because of the ethical and political tensions, and practical difficulties of negotiating consent to use such materials), but have rather drawn on common patterns of text and meaning in such communities to develop themes and questions for interviewing and analysis.

The textual source materials that I used were not only the printed word, but also consisted of images, both still and moving, that were amenable to semiotic types of analysis. Some of the sources of images were primary data, of two kinds. On the one hand, I asked during the focus group interviews if the participants could draw a number of pictures. This was to supplement their spoken word as a means of expressing their experiences of consumption, and their conceptualisation of their embodiment when participating in VR technologies. When interviewing computer experts, I occasionally asked them to draw 'maps' or diagrams of virtual reality systems (and could do so quite 'naïvely'); again, to provide an alternative means of expressing a conceptualisation of a technical network. The other source of primary visual data was photographs, which I took of the environments I was in at every possible opportunity. At times I was specifically asked not to take photographs (I think a product, again, of a commercial community organised around patents).

The final means of gathering 'textual' data was pursuing secondary sources of visual images — of which, in this industry, there are thousands. These included still printed images (of both physical and digital worlds), found predominantly in advertising brochures, in monographs, in textbooks, on web pages, on photographs and slides. The other visual images I used were the digital images generated by the software of virtual worlds, as well as both documentary and fictional television and video images. These images, like the textual productions before them, were all subjected to 'analysis' as an ongoing proposition throughout the research project, the process of which was discussed in 'Studying the Virtual I', and the culmination of which is represented by the thesis itself.

Conclusions

The dialogues established in participant observation and in interviewing, despite their sometimes problematic politics, have been continual sources of pleasure for me, and analysing the talk of highly intelligent, witty and lively participants has

been an ongoing intellectual challenge. The pleasures of participating, of observing, of interviewing, and of looking at images, have not only been intellectual pursuits, however. They have been crucially *embodied* pleasures, tactile, sensory, and passionate (Game and Metcalfe, 1996).

The contradiction at the heart of my research methods, the issues surrounding embodiment and disembodiment in knowledge making, has been a productive tension. My methods have become *re-incorporated* twice over into the research process, firstly as a means of gathering research materials, and secondly as analytical materials, a social text available for theorising. This theoretical reflection has generated useful insights about both my own knowledge making practices and their dis/embodiments, and the creation of knowledge about and through 'virtual' — computing and communications — systems in particular. This reflection has underlined the centrality of embodiment in research relations. Even more crucially in this project, it has underlined the centrality of embodiment in the worlds of virtual reality technologies. Both material and digital relations are central in the processes associated with 'becoming virtual'.

After tonight there would be only one world, to live in and to dream; and
Wonderland would never be more than a step away, a thought away ...
There was time for all their miracles now. For ghosts and transformations; for
passion and ambiguity; for noon-day visions and midnight glory.
Time in abundance.
For nothing ever begins.
And this story, having no beginning, will have no end.

Clive Barker *Weaveworld*

Notes

SECTION ONE – PROBLEMATISING THE VIRTUAL

Chapter One: Becoming Virtual

- 1 Commentators and critics to date have tended to conceptualise ‘virtual experiences’ as the inevitable effect of an a-social technological development on the people who use particular artefacts, or extensions of other similar technologically mediated activities, or a state of being which has existed before in different social forms which has now extended through the use of computer technologies. The conceptualisation of the technology/ society/ culture nexus is discussed in Chapter Two.
- 2 According to N. Katherine Hayles (1995: 323), ‘[t]he new cannot be spoken except in relation to the old. Imagine a new social order ... whatever the form, it can be expressed only by articulating its differences from that which it displaces, which is to say the old, a category constituted through its relation to the new ... The cyborg is both a product of this process and a signifier for the process itself.’
- 3 ‘Virtual systems’ is a problematic designation given debates in science and technology studies about the conceptualisation of technics as ‘socio-structural systems’ or as heterogeneous networks (see Section Four). My use of the term ‘systems’ here is not intended to suggest a structural analysis of virtual reality technologies in the tradition of, for example, Hughes (1987). My use of the term is, instead, derived from terminology in the computing field to refer to a computer ‘system’ (i.e., an entity made up of several heterogeneous and malleable components). ‘Virtual systems’ therefore refer to a range of these computing networks which extend communication, ‘telepresence’ or ‘cyberspace’ action and interaction (and so includes information and communication technology such as the world wide web and the internet). ‘Immersive virtual systems’ are those amongst these technologies that use interface devices such as HMDs and gloves (see Chapters Four and Eight). See Stone (1996) for a similar use of virtual ‘system’.
- 4 The issue of defining virtual realities is problematic. Some are intent on describing the ‘essence’ of virtual reality technologies (Heim, 1993) by defining them ever more finely in terms of the qualities of particular computing systems — usually measured

via concepts of immersion and interactivity (see, for example, Steuer, 1992). Some, like Michael Heim (1998), warn against the confusion generated by 'weak' use of the 'virtual' to designate anything digital, information based, or even to stand in for things imaginary or fantastic. My interest in this research is not to *define*, a practice which categorises and limits understanding of technocultural forms. Rather, I am interested in identifying productive connections between technology and culture, so am interested in how the 'virtual' as a term from optics referring to actions of light might connect with a system of signs which produce cultural imaginaries. As Donna Haraway (1992: 325) remarks, 'no matter how big the effects of the virtual are, they seem somehow to lack a proper ontology ... I can't forget that an obsolete meaning of "virtual" was having virtue i.e., the inherent power to produce effects. "Virtue" after all is excellence or merit ... The "virtue" of something is its "capacity" ... Virtual space *seems* to be the negation of real space ... but perhaps this negation is the real illusion.'

- 5 There are a number of different reasons for my interest in fully immersive virtual realities. Firstly, it is through the concept of immersion that I first encountered virtual realities, and it is this notion of immersion that seems to connect most strongly with the imaginations of many who work in the field. Secondly, one of my enduring sociological interests is with the social construction of the body, primarily within western culture, and fully immersive virtual realities are those which connect most closely with physical bodies, which have the potential to simulate a considerable range of corporeal sensations, and which challenge the way people think about their bodies and live in and through them at the surfaces of the organism itself, penetrating those surfaces through the production of bodily habits and gestures (see Chapter Four). The intimate connection between immersive virtual realities and physical bodies provides a particularly focussed site through which the gendering of bodies and subjectivities can be investigated, and connections between different discursive practices of gendered embodiment, and their representation or simulation, can be explored.
- 6 A discussion of how and why I gendered my opponent in the masculine will be taken up in Chapter Three.
- 7 I'm a little wary of using geographical metaphors since reading the work of feminist geographers who have deconstructed mapping practices to reveal problematic claims to fixed truth about landscapes, and people in relation to them (especially where such strategies have operated in both exclusionary and colonising ways). See Nancy Duncan (1996).
- 8 Traditions/ metaphors of journeying and travelling, in anthropological research in particular (Geertz, 1988), employ a genre like 'road movies' to produce narratives of research. Like the notion that 'virtual experiences' provide resources for the transformation of self, the 'journey' of the doctoral dissertation is just one such journey. See Deegan and Hill, 1991.
- 9 It was not easy to access fields where virtual reality technologies are produced and consumed from a small country such as New Zealand. The field' reflected my concerns with the role of materiality in the construction of 'the virtual', because people would generally only talk to me via electronic communication after they had met me 'face to face'. The problems presented by my chosen methods, and the contexts in which they were played out, are addressed in the Methodological Section.

Chapter Two: Problematising the Virtual

- 1 Such networks of power endure despite significant historical change. This is an orienting comment, rather than an unreflexively transhistorical or cross-cultural statement.
- 2 There are a considerable number of studies which use ethnographic, participation, observation and interviewing methods to address 'virtual' technologies in other forms — such as internet bulletin boards, chat groups, MUDs (multi-user domains) and MOOs (Mud Object-Oriented), and personal computing. Two useful collections are *Sociological Inquiry* Vol. 67., No. 1., Special Section on Technologically Mediated Communities, including Cerulo (1997), Vinoche and Marx (1997) and Turkle (1997). Kendall (1996), McRae (1996) and Gilboa (1996) all appear in Lynn Cherny and Elizabeth Reba Wise (1996) (eds) *Wired Women: Gender and New Realities in Cyberspace*. The ways that immersive VR is related to this cluster of 'virtual' technologies will become apparent throughout the discussion.
- 3 An important sociological exception is Schroeder's (1996) work which empirically investigates exactly those material networks and organisations which enable VR production and the uses of these technologies. Balsamo (1996) and Hayles (1996) both make important contributions which draw their arguments from empirical cases.
- 4 There are a number of popular accounts of 'virtual experiences', but these are rarely accompanied by critical analysis and reflection on the process. Rather such experiences are taken as foundational and 'real' or 'authentic' in some sense. Balsamo (1996: 120) highlights the irony that VR often relies on a rhetoric of 'real experiences' to sell digital worlds. See Chapter Five.
- 5 The most important point to emphasise here is that such a method focuses on specific aspects of cultural life in different sites, rather than concentrating on many different aspects of a culture in a relatively bounded location. See Methodological Section.
- 6 In Australia and New Zealand, 'imported' approaches are reworked and indigenous approaches produced, generating local theoretical traditions, often with a flavour of 'bricolage'. I regard this thesis very much in this tradition — working in/ on the analytical peripheries and 'borderlands' of theoretical and research practices.
- 7 My intention here is not to suggest that an approach designated by the categories 'feminist/ poststructuralist' is coherent, nor singular (and certainly not uncontested). A number of different analytical strategies and approaches are signified — and not all agree with each other. For debates on the analytical, epistemological and political utility of feminist poststructuralism in feminist thought, see Benhabib (1995), Fraser (1995), Butler (1992), Flax (1990, 1992), and Weedon (1987).
- 8 What is usually designated as 'poststructuralism' is a combination of Foucault's critical reworking of Marxist structuralist philosophers such as Levi-Strauss, the influence of Lacanian psychoanalysis, and a Derridean deconstruction of language use. These theorists have since been heavily reworked by feminist philosophers and social theorists to provide an approach compatible with asking questions about gender and power (see Weedon, 1987).

- 9 These boundaries are not only being disrupted in the sphere of new communications technologies. Elsewhere in western societies, previously sacrosanct categories of embodiment and identity are being disrupted in what some call a 'postmodern' moment (see Featherstone, 1995; Jameson, 1991; Harvey, 1990; Kroker and Cook, 1986).
- 10 In *Fascination, Masculinity and Cyberspace* (1996), Rob Milthorp reflects on the dynamics between social power and masculine identity in cyberspace networks. While he acknowledges the intimate and problematic association between technologies and the construction of masculinity in western worlds, he questions the inevitability or essentialism of those connections, and reflects on the possibilities for social change through new communications technologies.
- 11 'Garage' VR (a term to describe those who build VR 'outside' formal, legal or institutional organisations, or as a 'hobby'), produce artefacts which are characterised by those in the field as qualitatively different from other VR technologies. This differentiation is mainly defined and maintained through reference to the quality of the technical components. By contrast, I was interested in how they came to be defined *socially* as similar or different to systems designated 'not garage', on the principle that such categorisations are social established and maintained.
- 12 As I could not use *all* of my fieldwork materials in the thesis, I chose to focus on two main games systems — the Virtuality® systems, and the Sega Netmerc system, to provide counterpoint and contrast with respect to the former. There were, however, other systems in a number of arcades and theme parks. I encountered Kaiser Electornics games systems several times in both North American Europe, an immersive game of pool in which the participant takes the role of the white ball. Bob Ferris Productions produces a (predominantly passive) journey which simulates flying across a range of landscapes. The simulation is notable because beyond visual simulation, it also attempts to simulate the sense of smell, such as a pine scent when flying through a forest of cedars, for example.
- 13 It is difficult to focus on one element of a computer system while retaining the language of networks. Its worth keeping in mind here that an 'environment' is not something necessarily 'different' from 'the technology', but comprises social aspects of the technical network 'itself'.
- 14 The sociological and feminist practice of tracing stories as symbolic and discursive relations is centrally concerned with the symbolic and discursive operation of power relations. The ideological workings of power (and their sometimes problematic relation to material organisation) have been an enduring concern in sociology since its inception. Critical traditions in cultural studies such as the widespread and varied work of the Birmingham Centre for Contemporary Cultural Studies (see, for example, Hall, 1989) map a number of sources of discursive domination and resistance; in class relations, in gender relations, in relations of sexuality, or ability. Since the Frankfurt School (Adorno, 1990; Horkheimer, 1972; Marcuse, 1964; see Connerton, 1980), cultural theorists have been particularly interested in the interface between technology and culture, particularly in media (Williams, 1981). More recent approaches to 'technoscience and cyberculture' (Menser and Aronowitz, 1996) have continued that thread of concern. Feminist scholarship too has produced critical projects in the politics of embodiment and subjectivity which have focussed specifically on the symbolic construction of the relation between

culture and technology (see, for example, Stone, 1996; Balsamo, 1993; Haraway, 1991; Star, 1995a).

- 15 For an 'actor-network' critique of the 'technology as progress' argument of enlightenment modernity see Latour's (1993) *We Have Never Been Modern*.
- 16 Some who are interested in defining virtual reality technologies on an ever more finely differentiated table of differences from and similarities to other media, do so on the basis of the material form that the technologies take (on the assumption that this form is *essentially* and obviously unchanging because of its physicality. These typologies focus on the form of technologies as if they were 'objective' — rather than interpretive — 'black boxed' (Latour, 1987).
- 17 I don't want to suggest that the practice of speculation is problematic per se, as it is often speculation which imaginatively reconstructs technical and social worlds. Indeed, my understanding of (at least a part of) feminist projects is that they (albeit variously) speculate on what the world might look like without gender inequality. See Chapter Eight for a discussion of the relationship between speculation and technical problem-solving.
- 18 The interplay of notions of 'identity' and of 'difference' as defined through binary oppositions of categorisation are not limited to virtual reality technologies. Similar themes are found in discourses about the internet, world-wide-web and multi-media technologies, as well as the 'god tricks' of visualisation and medical imaging technologies (Waldby, 1997; Shields, 1996; Springer, 1996; Cartwright, 1995; Jones, 1995; Boddy, 1994; Balsamo, 1993).

SECTION TWO – EXPERIENCING THE VIRTUAL

Chapter Three: Reading the Virtual

- 1 Sociology has tended to marginalise analyses of the body until recently, however. See Scott and Morgan (1993), Shilling (1993), Turner (1984, 1991), and Frank (1990, 1991).
- 2 In keeping with my introduction to this section of the thesis, I attempt to treat none of these stories as 'originary', or more real/ authentic than others. While I want to foreground the lived experiences of participants, I do not want to 'test' theoretical or popular stories against a 'more real' *experience* of virtual worlds (or vice versa). My aim is rather to explore subjectivities, embodiments and experiences as a 'constellation' of physical, cognitive, emotional and identity *effects* (de Lauretis, 1984; Riley, 1988). In this sense, self, embodiment and experience are treated as material and discursive *assemblages* in specific virtual worlds.
- 3 Stuart Hall (1988) proposes that when individuals engage in discursive practice, multiple potential readings of any single text are entailed, some of which are more powerful than others by virtue of their ideological and material positions. See Valverde (1991) for a useful discussion of the uneven effectivity of multiple and intersecting discourses.

- 4 Throughout the thesis I have attempted to indicate appropriate trademarks and copyrights. These are important symbolic markers in networks which constitute socio-technical practice, as they indicate the confluence of economic discourses with cultural and technical domains of practice, especially as this relates to notions of 'private ownership', (economic or intellectual) property and its association with capital (Haraway, 1997a). See Chapter Seven for the organisational implications of patents, copyrights and trademarks.
- 5 Dactyl Nightmare™ is one of the most popular games played on the Cyber1000CS unit, which is 'reprogrammable' in the sense that a number of different games might be played on the same hardware (see Chapter Eight). In some retail outlets I have looked at, these units permanently run mDactyl Nightmare to the exclusion of others.
- 6 Perhaps it would be more interesting if the players got to be the pterodactyl? What would this do to the play of the game, and the experience of embodiment?
- 7 'Jack' is an ironic title for me. When I was exploring the notion of digital bodies, I watched a number of popular films which played on themes of cyborg bodies — melds of machine and organic parts. In the film *Circuitry Man*, the central 'bad guy' creates a digital space representative of his own mind, which he can connect others to via neural links with 'jackpoints' in his head — a direct reference to William Gibson's *Neuromancer* trilogy. At one stage, he offers the immortal words 'Why jack off when you can jack in?'
- 8 This realism is based in the attempt to manipulate light, sound, space and time so that objects generated by computer graphics cannot necessarily be differentiated from the objects which they seek to represent. 'Photorealistic real-time texture-mapped worlds' (Heim, 1993: 111) are what many virtual realities seek to achieve.
- 9 The speculative discourses of VR may say nothing about the bodies participants already inhabit, and the economy of meanings they already embody, but they do say something about the location of virtual systems in public space, and the relations of consumption and competition in entertainment sites. See Chapter Five.
- 10 An 'Avatar' is a digital body through which participants designate their presence in a digital space. 'Avatar' is another word for 'incarnation', which is derived from Hindu myth, in which an avatar was the descent of a deity to earth in incarnate form (human hubris at work in the 'colonisation' of digital spaces?). Debates about digital avatars, their importance, and the forms they should take, connect communities with interests in immersive VR with those of Internet 3d networked worlds (see <http://www.blacksun.com> for worlds such as Alphaworld). Whole galleries of bodies are being developed in the latter spaces, and conferences have been held to discuss the issues, such as the 'Earth to Avatars' conference in San Francisco, October, 1996.
- 11 It seems appropriate that this aesthetic developed out of Davies' own near-sighted (myopic) vision, considering the centrality of concerns around embodiment in OSMOSE©. Having trained in photo-realism in painting, she eventually abandoned 'the photo-realist world of hard edges and solid surfaces for a world of enveloping space filled with ambiguous volumes of luminosity' (Davies, 1995: 3).
- 12 The issues OSMOSE© raises speak to questions about a feminised 'nature' (woman as essentially nature), especially in 'enveloping' space (Sofia, 1992). While OSMOSE© interrogates the relations between specific bodies, their natural environments and

technologies, it simultaneously runs the risk of essentialising and reifying 'nature' associated with the 'feminine' by positioning it against the 'testosterone induced dreams' of the entertainment industries (Davies, 1995).

- 13 These comments are already edited as positive comments by Softimage® Inc. who wish to publicise the work on the website. The only 'negative' comments of which I am aware from publics or participants in the work (as distinct from professional critics) have been the comments from two young boys which Char Davies shared with me (an whose comments appear in Chapter Four). The positive comments from other immersants here do have resonances with commentary about the work from critics in art and technology worlds more generally.
- 14 I am particularly indebted to Interval's website for information about, and images of, Placeholder ([http:// www. interval. com/ placeholder/](http://www.interval.com/placeholder/)). I am also indebted to N. Katherine Hayles' discussion of Placeholder in her (1996) 'Embodied Virtuality: Or How to Put Bodies Back Into the Picture'.
- 15 Placeholder was shown at Banff Centre for the Arts, and produced in collaboration with them, but was ultimately too expensive to keep showing on a 'commercial' basis. See Chapter Seven.
- 16 Here OSMOSE©, and the participant's responses to it immediately after participation, captures some elements of the extra-discursive, when physical activities 'inside' and 'outside' OSMOSE© resonate with each other. The participant describes OSMOSE© as 'swimming', the specific conventions of which correspond to the regulated breathing activities of movement in OSMOSE©. This is 'reading with the body'.
- 17 While a number of individuals and collectivities can be positioned as 'actors', non-human entities may not be 'agents' as such. Nevertheless, it might be useful to think of non-human actors as 'actants'. Material objects can be bearers of meaning, on the one hand 'acting' on behalf of human subjects, on the other hand forming an environment in which humans can act, or not, in particular ways. They thus 'participate' in human interaction in so far as they have effects on human activity — including the human interpretation of meaning and the sets of social interaction which are generated through, and which influence the making of meaning. See Janet Rachel (1994) 'Acting and Passing, Actants and Passants, Action and Passion'.
- 18 Here, I am using Mark Gottdiener's (1995) approach to the study of signs, which focuses on the way that meaning derives from the material substance of the sign being interpreted, as well as its properties as an element in a language system, and thus the way the sign is materially embedded in a range of connected meanings. The approach combines elements of post-Saussurian and Peircean linguistics, and extends a four-fold theory of the sign. For Gottdiener, the 'expression' is the appearance or shape of objects. The expression of a sign refers to 'objects themselves ... which exist materially, even if that materiality is simply a text' (1995: 25). The 'content' refers to both generalized sets of ideas and cultural mores, and more specific sets of ideological relations that are coded in particular ways in specific nodes of social interaction (such as discourses within institutional or organizational settings). Each of these is further divided into a 'form' and 'substance' — the ways that the sign appears, and its connections to other signs, respectively.
- 19 The 'objects' in a digital world — including digitally rendered bodies — which the player perceptually encounters in a digital world can be 'read' as digital

representations. Each digital object exists as a sign which articulates in chains of signification. These signs consist of material shapes and forms, attached to fields of meaning, which are ideologically institutionalised in social practices. These chains of signification are materially, spatially and temporally located in specific social sites, sites which co-exist with others in networks of signification, physical spaces and ideological fields. Most importantly though, these sites are relational, and it is these axes of social practice and meaning, as elaborated in significations, which comprise a sense of embodiment and the construction of experiences in 'real life' as well as virtual worlds. These multiple layers of connection open spaces for polysemy — the recognition that signs are comprised of multiple aspects of signification and meaning, and that even though 'preferred' or hegemonic meanings tend to dominate meaning-making processes, chains of signification and their contexts provide a field in which ambiguous and sometimes contradictory positions are available to those who engage with them.

- 20 The interview from which this quote was taken was conducted in 1996. At the time, unbeknownst to the player, *Virtuality*® was negotiating with those who owned the copyrights and trademarks on *Pacman*™ for a virtual reality version. This version was released in 1997/8, and the problems associated with its construction are discussed briefly in Chapter Eight.
- 21 Here I am using 'gaming' in a wide sense to include both non-electronic and electronic/ digitally mediated games. I would include simulation/ educational games here, as well as fantasy role-playing games, and video and computer games. Myers (1990) notes that in research about computer or video games, the questions tend to focus on identifying populations of video game players, the effects of the games on those players, and the motivations of those players to play video games. As a result, 'current research on "video games" sloppily considers all computer games roughly equivalent in uses and effects' (1990: 18). Fine (1983) differentiates between simulation games and fantasy role playing games on the basis that there is a difference between role playing and role taking. My aim here is merely to draw out those strands of different 'gaming' practices that are apparent in the VR I am looking at.
- 22 He goes on to add that 'in some ways, every new computer game is its own world, a distinct semiotic system, and it is the very process of learning (or conquering) that system that drives interest in the game' (Friedman, 1994: 74). Myers (1990: 18-20), for example, notes that while research on film, television and books generate identifiable genres, the computer game is not exactly like any of these - and so it needs its own critical criteria.
- 23 Kevin Robbins (1994: 314-315) notes that 'it is not that we now live in the realm of the image; it is, rather, that there is, in our culture now, a kind of collective, social mechanism of splitting. The spectator-self is morally disengaged, floating about in an ocean of violent images. The actor-self is caught up in a reality whose violence is often morally overwhelming. How can we come to terms with this situation wherein the spectator and the actor seem to be going their separate ways?'
- 24 There is significant debate amongst both VR producers and 'publics' about what exactly constitutes 'interactivity' (see, for example, Steuer, 1992). The most interactive VR world, and arguably the strongest reason to employ VR rather than any other medium (Schroeder, 1996), is that participants could thereby build worlds from the inside — and this is exactly what is not possible in publicly available VR, but is becoming available on PC platforms in the home.

- 25 An analysis of 'virtual realities' similar to that of Baudrillard has also been developed by, for example, Kroker (1993), and various authors in Kroker and Kroker (1997). Baudrillard's theory of signification and hyperreality are developed in *For a Political Economy of the Sign* (1980), and *Simulations* (1983). For a critique of Baudrillard see Mike Gane (1991).

Chapter Four: Writing the Virtual

- 1 To argue that a 'feedback loop' is formed is not to argue that this loop is 'seamless', nor that it is necessarily coherent. See Hayles (1996a).
- 2 There is an extensive literature in science and technology studies which documents various kinds of retooling, not only fictional, but also in, for example, reproductive technology (Sawicki, 1991; Treichler, 1990), medical imaging (Waldby, 1997; Cartwright, 1995), genetic engineering (Lewontin, 1994; Marks, 1994), as well as already existing retooling technologies in science and medicine (Woodward, 1994).
- 3 Throughout the time period in which this research has been conducted, such small and light display systems have been developed by a number of firms. See, for example, the Virtuality® website (<http://www.virtuality.com>). Virtuality® preserved the rights to the Virtuality® trademark and patents on Virtuality® display technology when Virtuality® declared itself bankrupt in 1997 and was bought by Retinal Displays®. The website demonstrates Virtuality® display technology.
- 4 The early development of glove technology entailed some controversy. The production of the datagloves was first patented by VPL® Ltd., who patented not the gloves themselves, nor the *specific* techniques of tracking which made them work, but instead patented any 'device' which achieved the functions that the gloves did (no matter through what techniques or means they were achieved). This effectively prevented research on any number of devices which achieved the same effects. This was cause for a great deal of controversy within the VR community. See Chapter Seven for the importance of standards and patents as organisational dynamics in technical production.
- 5 In Gibson's (1986) *Neuromancer* these head plugs are called 'jacks', and are most common amongst cyberspace 'cowboys' — the equivalent of contemporary 'hackers'. 'Jacks' are revered in cyberpunk subcultures as the most closely coupled human - computer systems, and as such become symbolic of the digital/ virtual condition. In *Neuromancer*, digital/ 'cyborg' bodies figure prominently. Case, the central character, is a data thief who 'jacks in' to the cyberspace matrix through implanted sockets which provide direct neural linkage to information space. Molly, a woman with implanted optical sensors and retractable five inch scalpel blades under her fingernails figures as an assassin, and Case's sometimes partner. In Tad Williams' (1997) *Otherland*, by contrast, these implants are called 'cans' (a contraction of 'neurocannular implants'), and are the province of the military, high level government bureaucracy, or the ridiculously rich.
- 6 VR perhaps provides more opportunities to make oneself sick than other games, both because of 3d effects, but also because the tracking process is slower than human vision — producing a kind of 'motion sickness' which those in the trade call 'simulator sickness'.

- 7 Grint and Woolgar (1995: 52-53) argue that replacing technological determinism with the social determinism of 'effects' is inadequate because it preserves the essentialism of attributing objective and measurable qualities to technical objects.
- 8 Dennis Potter's (1997) *Cold Lazarus* is an example of the conflation of virtual reality and surveillance technologies. This science fiction television series is set in a time where VR (in the form of existing goggles and gloves technology) is used for communication telepresence — to speak 'face to face' with distantly located people in real time. At one point in the narrative, a conference takes place between two geographically dispersed locations. One character continues to listen to the conversation of others after he has ostensibly 'left' the conference (without the knowledge of others), using the same technologies with which he originally communicated with the participants. As Dale Spender (1995) says of internet technologies, those very technical systems which allow them to *communicate*, allow them to be *monitored*. See Bogard (1996) for an important discussion of new information and communications technologies, and the implications for surveillance.
- 9 The concept of 'presence' is so important in discussions about virtual reality technologies that the word has been taken as the title of the only academic journal I know of devoted to the discussion and development of virtual reality technologies. This journal mainly publishes computer science and engineering papers (although the journal is interdisciplinary), and it is mainly these groups, along with those working on 'human factors' issues, who study and elaborate a notion of 'presence'.
- 10 'Immersion' is used by computer scientists to refer to a combination of 'presence' and 'interactivity' (Schroeder, 1996).
- 11 The only, and brief exception to a first person point of view is when a third person point of view is employed to communicate information about what is happening in the game play that could not be communicated via a 'situated' viewpoint. The momentary third person point of view in *Dactyl Nightmare* is one which occurs when the pterodactyl in the game picks the participant up from the game board and flies high with their body. Another moment like this is at the beginning of each 'level' in *Sega Netmerc*, which plays a short orienting scenario, before it switches back to a first person point of view.
- 12 Berger (1974) goes on to discuss the ways in which the technical mediation of photography and film shifted viewing conventions from an ideal in which an infinity of views is potentially represented, to one in which infinite reproduction of images creates a view specific to time and place, and simultaneously shifts the meaning of those images.
- 13 The availability of a number of different viewing positions is common in PC-based world building software, whereas it is uncommon in location-based entertainment.
- 14 Positioning the work against photo-realism in this way is also a positioning amongst competing standards and conventions of art worlds. This is how the work is conceptually, aesthetically and socially aligned with the collective practices and associated groups of art production (see Chapters Six and Seven).
- 15 Virtual Worlds Entertainment Ltd. produces an entertainment venture which uses specific technologies (dubbed 'translocators') in dedicated locations. What it lacks in technology, it makes up for in storytelling. Sites are entirely given over to the fantasy

of the 'Virtual Geographic League', an imaginary group of aviationists 'founded' in 1897. This group was, in the words of Virtual Worlds' publicity, 'a formerly secret society dedicated to the discovery and exploration of other dimensions. In order to fund ongoing research in 1990 the V.G.L. board elected to open Virtual World sites to the public. Thanks to this Landmark decision, we can all now enjoy the excitement and camaraderie of interdimensional travel.' The story is one of time and space travel, via a pod-like machine. The site is constructed as a private 'club' (including a reception, bar and leather armchairs in 1920s style) where members are 'translocated' to other dimensions via these machines. Briefing is carried out beforehand by staff and via video, and a 'pilot' (player) is taken through to the machines and installed in them by support staff to complete their 'mission'. No experience inside the walls of the Virtual World centre lies outside of the fantasy world. Extensive leagues are formed, especially with 'Battletech', which has achieved something of a cult following. Members are given cards bearing their 'call sign', and bar codes (with their history of play encoded on them). Codes of ethics and behaviour have been formulated, and the performance history of the 'mission' is printed out and given to the pilot on their 'return'. While extremely popular in the United States, and having further centres in Japan, Europe and Australia, Virtual Worlds has not been included in the research, primarily because it is not an 'immersive' technology (as conventionally and technically/ physically defined in the virtual reality industry). It is, however, 'virtual', and is an important counterpoint to the stories and environments of immersive technologies. It is a comparison I hope to take up in further research.

- 16 As has been suggested in earlier chapters, technologies are prosthetics which take humans beyond the boundaries and limitations of their organic physicality (Sofia, 1995), extending their senses and enabling activities otherwise impossible. Feminist philosophers and social theorists have explicitly examined the ways this instrumentality supports discourses of idealised transcendence as masculinist: the imagined bodies of scientific and technological rationality are constructed around the assumption of a masculine embodiment (Trawick, 1988: 41).
- 17 Perhaps these phrases should read '*some people's* everyday experiences of terrestrial space'.
- 18 This is not to say that alternative systems don't exist, systems which *do* account for a range of different bodily abilities. There are a number of computer scientists, engineers, social scientists and policy makers (within industry and within the state) who are interested in exactly these issues. My claim here is simply that discourses which 'normalise' embodiment tend to assume an unproblematic bodily connection with physical artefacts which is certainly not the case in publicly available systems at present for some people with some disabilities.
- 19 Criticisms directed at head mounted displays have suggested that this particular technical artefact detracts from the sense of immersion the experience, and the body becomes heavily encumbered with clumsy, sometimes weighty and putatively 'unhealthy' devices. Char Davies (1995) considers this point alongside the equipment that she uses when scuba diving, and points out that wearing fins, mask, goggles, weights, air tanks and buoyancy control vest is a minor inconvenience for her and other divers, as it offers access to oceanic space.

SECTION THREE – LOCATING THE VIRTUAL

Introduction

- 1 This lack of attention to embedding virtual reality technologies in 'everyday life' lies in relative contrast to research about other digital/ electronic computing and communications technologies. The case of communications technologies (Silverstone and Mansell, 1996; Haddon, 1992; Silverstone, Hirsch and Morley, 1992), especially as they connect to other media (Silverstone and Hirsch, 1992) in 'everyday life' (Terry and Calvert, 1997; Silverstone and Haddon, 1996; Murdock, Hartmann and Gray, 1992) is relatively well documented.
- 2 Schroeder (1996) is an important exception to this comment.
- 3 This is often the case in 'popular' literatures on virtual reality technologies. The majority of the cases described are highly specialised projects in government and university research labs, or patented products in private VR manufacturing firms. It seems that these popularising books can effectively serve as promotion/ advertising for virtual reality technologies with little expectation that those who read the books will have any stake in their design, manufacture, distribution or ethical/ policy negotiation.
- 4 The term 'context' is in quote marks here because the separation of 'object' and 'context' has been problematised by theorists in science and technology studies who subscribe to 'network' approaches. Section Four on 'Building the Virtual' explores these issues.

Chapter Five: Consuming the Virtual

- 1 My categorisation of technical systems as 'public' is rather fraught. My intention is not to institute a dualism and differentiate systems on the basis of the boundaries of private dwellings (as these differentiations are problematic. See Duncan, 1996). Rather, my intention, as earlier, is to focus on systems that are available for participation by those who are not technical experts.
- 2 This assumes that people and machines, individuals and organisations, discourses and practices, and the relations between them are put together — constructed — and depend on each other in technology practices (Latour, 1983, 1991, 1994; Law, 1987). It also assumes that the process of creating, distributing and using technologies such as VR is simultaneously a process of building (and maintaining) social and economic institutions, as well as creating available identities out of a meld of culture and technology.
- 3 The significance of play in culture has been elaborated by a number of social and cultural theorists. See Geertz (1973) for notes on the Balinese Cockfight, Huizinga (1949) for a treatise on play, and Goffman (1972), for reflections on 'games'.
- 4 The communities of interest whose 'presence' is implicit sites of VR consumption include local authorities concerned with zoning issues, to state interests in regulating

- health and safety, to wider worlds of play, leisure, entertainment whose audiences and operations cross-cut those of VR consumption.
- 5 The literatures on historical formations between leisure, pleasure and consumption are extensive. For various American analyses of the historical transformation of leisure and consumption see Butsch (1990). For British historical and contemporary analysis of pleasure and consumption see Clarke and Critcher (1985: 48-99), and Bennett (1983).
 - 6 David Brande (1996: 89) uses Jean Joseph Goux (1990) to discuss how this tendency towards ever more abstracted relations of economic exchange value is represented in an extreme form in cyberpunk literatures, thereby rearticulating an ideology of the inevitability of such economic organisation.
 - 7 Like many amusement parks before them (Weinstein, 1992; Hawkins, 1990), video arcades have come to be associated with danger. In a process similar to that of fantasy role playing games, which have been linked with 'crime, satanism and suicide' (Lancaster, 1994: 67), arcades have been associated with deviance, crime, gambling and violence, especially because arcade game playing has been associated with working class (male) youth (Shuker, 1995; Price, 1985: 119-120).
 - 8 A number of authors have documented those sites of pleasure which combine elements of the fantastic, the tacky or the grotesque. See, for example, Weinstein (1992) on Coney Island, and Cummings (1986) on the pleasures of the circus.
 - 9 Kinder (1991: 97) goes so far as to claim that '[m]ost theme parks are structured like video games — with their time warps, their multiple worlds of adventure, and their conversion of passive cinematic spectatorship into interactive play.'
 - 10 John Perry Barlow, VR evangelist extraordinaire, called virtual reality technologies a "Disneyland for epistemologists" (in Springer, 1996: 82).
 - 11 'Internet Relay Chat' and 'Multi User Dungeons/ Domains', both 'multi-user' networked computer technologies.
 - 12 There are class dimensions to these leisure activities. I engaged in a lengthy conversation with a barman at a café in Berlin. When I asked him who most often came and spent time at the café, his dismissive response about 'the type of people who like this kind of thing' suggested that that this 'type of people' were assuredly engaged in a 'lesser' class of pleasure. In contrast to himself, presumably, who was engaged in hospitality work to fund a year's masters degree in international politics at an English university.
 - 13 Disney has also become involved in VR through its Disney Imagineering company, who have been developing of a VR ride at their Epcot centre in Florida. It is themed around the film *Aladdin*. See Pausch, Snoddy, Taylor, Watson and Haseltine (1996).
 - 14 There are disjunctures between representation and simulation. A number of contemporary cultural theorists argue that there has been a collapse of boundaries between fantasy and reality — between signs and referents, 'reality' and hyperreality — in an order of 'simulation'. It seems that the impetus towards simulation is reined both by the identities subjects bring to the signs, and the material activities surrounding it. As Olalquiaga (1992: xvi) argues, '[t]he flattening of meaning does not imply its disappearance but rather a shifting of registers that allows the

formation of new ways of signifying. The flattening of meaning is the exhaustion of certain features that were believed to be intrinsic to it — depth ... linear causality, univocality ... This can be clearly appreciated in the extremely hybrid character of contemporary cultural identities, which cannot be defined according to national origin or other types of inherent belonging, but rather by the intricate and extensive web of relationships that different individuals and groups establish in their daily practice and in their imaginary enactments.' VR is therefore caught in its spectacles between attempts to represent both real and imaginary worlds, and simulation, which always/ already pre-exists digital world building.

- 15 According to Laura Kipnis (1993), changes in narrative form and structure over time, as well as changes in the film industry, have challenged the subject/ objects organisation of looking theorised by Mulvey (1975).
- 16 A range of authors in literature and cultural studies have discussed the implication of intimate human connection with sometimes invasive/ penetrative technologies. See Halberstrom and Livingston (1995), McCaffrey (1991), Ross (1991), and Pfeil (1990).
- 17 These are familiar rules and regulations, considered reasonable by both operators and the local governments which require these regulations for zoning permission (responsible local government). The latter local law is consistent with state law which attempts to regulate the behaviours of minors. At the same time, the 'no eating and drinking' rule is common amongst other public spaces and utilities such as transport systems.
- 18 A T-shirt I picked up from the Computer Game Developers' conference put it in a slightly different way. Its slogan was 'Better Living through Mindless Escapism'.
- 19 Other location-based virtual reality units also carry monitors of varying sizes. In some, such as the Sega Game, a single large monitor is used. In others, a monitor is built into the pod. Virtuality® tends to work with several small adjacent monitors, or a 'bank' (3x3 or 4x4) of monitors attached to a number of games.
- 20 'Prebriefings' are common in many leisure pursuits, not only electronic worlds. Participants in bungee jumping, for example, watch a video before they leap, and those who Scuba dive or skydive also view a pre-recorded video tape.
- 21 Often there are trade-offs (given limited/ specific processing power) between the speed at which graphics can be processed to provide the illusion of movement, and the resolution (pixel concentration, or fineness/ density of image) at which those images can be displayed. See Chapter Eight, Building the Virtual, for a brief discussion of some technical aspects of VR systems.
- 22 Guy Debord argued in *The Society of the Spectacle* ([1967] 1995:12) (a seminal text that has received elaboration in philosophical and sociological texts since) that the spectacular transforms images into realities through the totalisation and abstraction of commodity forms. An abundance of commodities — both objects and relations that are signified and embodied in objects — is lived as banal image, which 'buries history in culture' (Debord, 1995: 137) and erases the lines between self and world, reality and fantasy.

Chapter Six: Selling the Virtual

- 1 See also McCaffrey's (1991) edition *Storming the Reality Studio*, Foster's (1993) special issue of *Genders*, and Featherstone and Burrow's (1995) *Cyberspace/ Cyberbodies/ Cyberpunk* for critical commentaries on cyberpunk literature.
- 2 Gibson-Graham (1996) argues, in a convincing deconstructionist account of economic discourse, that the logic of 'economy' as a discursive construction can be rethought in radical ways, which configure many alternative political possibilities. See J. K. Gibson-Graham (1996) *The End of Capitalism (as we knew it): A Feminist Critique of Political Economy* Cambridge, Mass.: Blackwell Publishers.
- 3 I wrote this as a form of fieldnotes when initially exploring theme parks and arcades in California. Some of it was my impression of the sanitising activities at work in some VR leisure centres and the malls in which they were situated. Some of it was people in theme parks mentioning 'homeless people' as a category of people who might come in and 'defile' the machines — literally render them 'unhygienic'. 'These people' were discouraged in the mall and its environs (see Duncan, 1996 for a discussion of public space as private space). These interactions made a significant impression on me, the product of my own cultural shock at the extent and visibility of homelessness in the United States where I was living. This prompted me to think through the diversity of people in urban space in complex contemporary societies, the different ways virtual realities might have meaning for them, and the people for whom such issues are socially meaningless. This is especially the case with homelessness and illiteracy. As Markley (1996) notes, considering the extent to which print is supposed to be replaced with digital/ informational structures, much of the construction and interpretation of virtual realities is carried out via print media, and this is certainly the case in leisure centres.
- 4 Virtual Worlds Entertainment Ltd. has the most comprehensive 'preplay' video that I saw. It is of film quality, with Hollywood names, which played for around five minutes before the player (me) was taken through to the game pods — 'translocators'. A full description of Virtual Worlds Entertainment is provided in Endnote 15, Chapter Four.
- 5 Many simply consume by watching rather than directly participating in virtual worlds. Those that distribute virtual reality technologies suggest a number of reasons. Some argue that it is a fear of the 'other', a fear of what the technologies might do to someone's sense of embodiment and being in the world (which reinforces the notion that VR is threatening *because* it challenges boundaries).
- 6 I had not been doing research at Digital Realities for long before it was suddenly announced to the staff that the store was closing. I had arranged to meet the manager one afternoon, and he called to tell me that he would not be there at that time — and neither would the store. The staff found themselves out of work, and the technology reappropriated, in the space of two days.
- 7 Equipment damage is common, and not always accidental. I went to visit one installation of Virtuality® Pods, and the fairly significant cabling which attached the head mounted display to the processor in the pod had been completely severed by someone taking a knife to it — for no apparent reason. It was, apparently, working perfectly at the time.

- 8 Detour: Brain Deconstruction Ahead, by Rita Addison, showed at SIGGRAPH (see Chapter Seven) along with other demonstration worlds at the University of Illinois at Chicago Electronic Visualization Laboratory's demo space. See [http:// evlweb. eecs. uic. edu/ EVL/ VROOM/ HTML/ PROJECTS/ 45Addison. html](http://evlweb.eecs.uic.edu/EVL/VROOM/HTML/PROJECTS/45Addison.html).
- 9 In Chapter Seven I discuss Hayles' (1996) assessment of Placeholder as an experiment that was not, ultimately, economically viable as an ongoing exhibition and installation proposition.
- 10 The support issue is connected to the entrepreneurial nature of these markets, and the rapid raise and fall of small firms as per the computer industry more generally. See Chapter Seven for a discussion of the organisational field of VR.

SECTION FOUR – BUILDING THE VIRTUAL

Introduction

- 1 Widespread and interrelated networks of economic activity embed an emerging information economy, while information is increasingly important in the movement of newly extended networks of capital. A number of theorists have examined the emergence of 'virtual capitalism' (Kroker, 1996. See also Lévy, 1998, Castells, 1997a, de Landa, 1996), although the notion of globalisation, as well as that of the 'information society', is contested.
- 2 Defining artefacts simultaneously (and necessarily) entails struggles over the definition of the human. See Woolgar, 1991.
- 3 While I want to examine how these artefacts are made, I don't want to treat them as originary, or deterministic. Those within the VR industry, as well as without, have often been careful to make connections between virtual reality technologies and other computing systems, as well as other identities, activities and/ or states of being (see Hayward, 1993; Steuer, 1992; Laurel, 1991; Helsel and Roth, 1991).
- 4 I include this quote here because of its similarity to the scenes I recorded in my fieldnotes which detailed the rooms in which I saw Virtuality®'s machines made. I was struck by the scene of 'pods' half built, and resorted to organic metaphors to describe my sense of the machines' 'guts' spilling out across the floor. My own version described bare and utilitarian spaces, filled with the presence of machines far more than that of humans. Walls were filled with shelves of replacement parts, floors were strewn with half attached boards and plastic casings, and the rooms bore the scent of solder.
- 5 'Actor-network theorists' are themselves deconstructing the term 'actor-network' as it has come to be used in abstract and/ or prescriptive ways. See Latour (1997). I am utilising the label here simply as a convenient descriptive category which encompasses a range of (sometimes different) ways of approaching the analysis of technologies.
- 6 Virtual reality systems are not only heterogeneous in Law's sense, but are already — doubly — *technical* hybrids. Firstly they are computer systems comprised of

malleable and replaceable/ reconfigurable components. Secondly, and importantly, computers are 'Turing machines', machines which can 'become' any machine a potential designer or user wants them to be (a computer 'acts as' a calculator, a typewriter, a photographic process etc.).

- 7 There is considerable debate in Science and Technology Studies between 'technical realists', social constructionists and actor-network theorists. In short, this debate attends to the relative determinism of technical and/or human social organisation (the question of where boundaries are placed in the technology/ society divide). The exchanges discuss who acts, where and how in technical and social organisation (questions of structure and agency), as well as the politics that attend such conceptualisations (questions of power, control, inclusion and exclusion). My own approach is outlined in the main body of the text. Examples of the (ongoing) debate in science and technology studies can be found in: Special Issue of *American Behavioural Scientist* Vol. 37., No. 6., May 1994.; Wiebe Bijker and John Law (eds) (1992) *Shaping Technology/Building Society* MIT Press: Cambridge, Mass; Wiebe E. Bijker., Thomas P. Hughes, and Trevor Finch. (eds) (1987) *The Social Construction of Technological Systems* Cambridge, Mass.: The MIT Press.
- 8 The work done by those on the 'margins' in virtual systems 'production' includes those embodied labours of desire and identification on the part of participants, which are discussed in Chapters Three and Four.
- 9 As well as Martin's critique, see Law (1991a), and Star (1991).
- 10 Latour (1988a) presents a discussion of Machiavelli's *The Prince*, both as an appropriate demonstration of how technologies are politics by other means, and how *The Prince* is a useful theoretical approach with which to carry out the analysis of socio-technical networks.
- 11 Throughout this section, I will be drawing on material from interviews with some of those who produce VR in the United States, New Zealand and Britain, as well as my observational work visiting manufacturing, university and community/ private sites in Europe, North America and New Zealand. See Methodological Section.
- 12 This is not to say that technologies cannot change. Rather, it is to focus on those aspects of design and production processes that link the material and discursive frameworks of different groups across time and space.

Chapter Seven: Organising the Virtual

- 1 For a critique of structuralist approaches to technology production, see Latour (1983).
- 2 It is difficult to find one conceptual term that encompasses many different kinds of 'organisation'. I use the term organisation to refer to businesses/ firms, groups within them such as the OSMOSE© production team, and informal interest groups. Some authors in the sociology of organisations have moved from treating organisations as bounded 'corporate' entities, to shifting boundaries of alliances amongst a range of entities played out in networks. See, for example, Nohria (1992).

- 3 A productive collectivity in virtual reality can include programmers, engineers, managers, administrators and graphics experts, as well as some of those more invisible members of the organisation who do support work such as cleaners or secretaries, sales reps or data entry operators. See Chapter Eight.
- 4 As I hope will become apparent, what constitutes a 'workable' cost is an achievement, rather than determined *a priori*.
- 5 'OSMOSE©' cannot become an object/ commodity in total, as parts of its hardware are borrowed from other businesses, rather than owned by Softimage® Inc. Were a gallery to 'buy' it, it would also necessitate buying a Silicon Graphics® Onyx™, and giving up permanent installation space for its operation. See Chapter Eight for a more extensive discussion of OSMOSE©'s physical/ technical form.
- 6 Copyright is the point at which the interests of individual ownership, corporate ownership and state regulation meet, and is a state/ law enforced discourse of ownership which cuts across relations of cooperation and alliance in a small industry.
- 7 'Rules of thumb' (Rammert, 1997), or the work of the 'invisible elbow' (rather than 'invisible hand'; see Tilly, 1996), mean that the formation of organisations is often ad hoc, or done 'on the fly' (or through a process of 'error correction') with the cooperation of other groups. Firms don't necessarily follow profit maximizing strategies and cost-benefit analyses when they select innovation projects. Says Rammert (1997: 185), 'Companies' behaviour is dictated by rules of thumb and decision routines ... Technical progress ... can be compared ... with the practice called 'learning by doing' ... than with rational decision-making. It is in principle non-directed, unsystematic, and contingent, which also means that it takes a particular path more accidentally than intentionally.' This is seen in the process through which Virtuality® has periodically restructured itself over the course of its existence as a corporate entity.
- 8 According to N. Katherine Hayles (1996: 19), Placeholder consisted 'of over 25,000 lines of code, it ran on no less than eleven computers, including three Onyx [sic] Reality Engines and a Macintosh Powerbook ... Despite the stated aim of providing an alternative for the video game industry, the simulation is not commercially viable in its present form.'
- 9 While the first prototype was being built, and the business plan written, a second prototype was begun, called the giraffe. The official explanation for its long craning neck was that the mechanical tracking devices for the display had to move in order to track. Just as importantly, however, '... [the] long craning neck with this headset on the end, ... was the only way, because of the weight of the thing, that you could wear it without breaking your neck' (Jon Waldern, Interview, Palo Alto, June 1996). The giraffe turned out to be Virtuality®'s first operational system, and it was duly 'unveiled' as such. This is the system in which Wembley and British Technology invested.
- 10 While still in the United States, for example, I was told about special interest groups in Nottingham and Durham (England). These groups were/ are attached to universities, and people in the United States had participated in 'virtual' discussions with members of the group in England.

- 11 Individuals hold together special interest groups, and groups often disintegrate should those individuals take a break. VRASP, for example, no longer exists because its founder, Karin August, can no longer sustain her involvement given her other commitments.
- 12 Burt (1992), echoed by DiMaggio (1992), notes that social, as well as financial and human capital, is a factor in the ongoing organisation of economic networks. Particular forms of 'social capital' discussed in organisational theory include a politics of identity — similar age, interests, socio-economic status, overlapping connections — in social networks. This chapter deals, at least in part, with the social capital which arises from educational levels, gender politics, and socio-economic status in technology production. See Barley, Freeman and Hybels (1992) on the value of social alliances in the biotechnology industry, and Nohria (1992a) for the significance of a 'richly interconnected social structure' in kinship, politics, ethnicity and institutional affiliations in 'high tech' communities such as Silicon Valley.
- 13 The project team that produced OSMOSE©, for example, has since produced Éphémère©, which was another three year project for Softimage® Inc. headed by Char Davies. Davies has formed an independent website for OSMOSE© and Éphémère©: [http:// www. immersence. com](http://www.immersence.com).
- 14 The role of 'uncertainty' stands as a critique of both economic and technological determinism.
- 15 In response to approaches which focus on the production of technologies to the exclusion of their consumption, Cowan (1987) has argued that the consumption junction — the relationships in which production and consumption meet — is the most fundamental relationship in technology construction. See also Woolgar and Grint (1991) for a discussion of interpretivist accounts of science and technology studies, and the production-consumption junction.
- 16 I don't want to assume the *a priori* role of economics in 'markets', nor do I wish to reify individual actors as agents of free will and choice. Nor do I want to reify a structured group of relationships amongst stratified collectivities based on assumed identity categories. This formulation is an attempt to move across the structure/ agency and economic/ social divides.
- 17 There are always trade-offs in decisions about the role of attendants, however. One of the contradictions in this situations is that location-based ownership and management intimate that they would rather not leave the customers to their own devices as this means people have too much freedom to wreck the machine.
- 18 This characterisation of birth makes an implicit connection with discourses of birthing as a medically defined event subject specifically to technical intervention. This technical discourse of childbirth (a techno-scientific rhetoric) sees birth as an event in which a foetus makes its way to the outside world with help from technical experts, thereby rendering the birthing mother invisible. See Treichler (1990) on the discursive construction of childbirth.
The metaphors of birthing appear relatively regularly in discussions of virtual realities and cyberspaces: from the imagery of the organic body's birth into a new digital world (see Figs. 7-2 and 7-3), to the characterisation of users as infantile (inexpert), to the metadiscourse of cyberspace as the 'birth' of a 'new world'. See Zoe Sofia (1992) on the psychoanalytics of digital cyberspaces as 'womb' spaces, and Claudia Springer (1992) on cyberspace as a feminine space. See Kevin Robbins

- (1996) on cyberspace as a regression to an imaginary and omnipotent infantile narcissism.
- 19 The exception was a conversation I had with one manager which centred on an architectural application. The manager concerned described the ways that an architect and his clients, a heterosexual married couple, could enter a virtual house from different parts of the country. This way the couple, in conjunction with the architect, could negotiate the relative sizes of *his* garage and *her* kitchen by moving the virtual walls.
 - 20 I never found out how one measures 'history of enjoyment', but I remain intrigued.
 - 21 Focussing on home use technologies entails shifting assumptions about the 'users', who become direct markets. With home or 'consumer' virtual reality, Virtuality® can extend the scope of their potential networks, cut out the distribution intermediaries, and directly formulate the attributes of their users in relation to the machines they are building. This potential shift in market relationships is positioned in contradictory ways in the rhetoric of the company. It is discussed both as an inevitability created by outside structural forces (as in the 'invisible hand' of 'The Market'), and simultaneously as the creation of specific market relationships by the company. As Martin notes, 'Our models are very expensive to implement in public space ... you got to push the threshold ... cause each system has a single user. You got to pay for an attendant to be standing by to tell you what to do. You've got to pay for someone to tell how to play beforehand and ... then the capital cost of the equipment as well. You're starting to exceed the four to five dollar experience model. But in the home it's a whole new set. Somebody buys a piece of software ... or a new peripheral for the home, they'll happily spend three, four hours just familiarising themselves with navigation, the joystick or software before they really start to enjoy the game. Very rare that you get straight into a game. You're playing it and you're enjoying it straight away that's the arcade model - but that's almost what you have to have to really truly appreciate VR. That's why we were the first into the home - it's that important to us. That's how people are going to really start using VR' (Interview, Palo Alto, September 1996).
 - 22 Ironically, should Virtuality® shift to home markets, garage VR practitioners will be one of their biggest markets, and the 'users' of both groups' products will be very similar.
 - 23 SIGGRAPH is the premier international trade show for the computer graphics industry, sponsored by Silicon Graphics® Inc.
 - 24 Balsamo (1993) notes with some irony that her mother was a computer but never learned to drive. Historically, 'computers' were often women. The work was clerical, and mundane. Their labour was displaced and eventually replaced by the 'computers' we now know.
 - 25 These alliances collapsed when Virtuality® announced its bankruptcy in 1996/7. Retinal Displays Ltd. bought majority interests in the company given their interests in the research and development of display technologies. The brand name of Virtuality® was retained to sell consumer head mounted displays still being developed.
 - 26 As the bumper sticker says, in an ironic mimic of *Star Trek: The Next Generation's* 'Borg', 'We are Microsoft. You will be assimilated.'

Chapter Eight: Producing the Virtual

- 1 By 'technologists' here, I mean those who are involved in physically and digitally building VR systems. This group includes those who employ *various* techniques to create VR systems, including, for example, the chemical firms who produce moulded plastics for computer housing, or those who storyboard content, as well as engineers and programmers.
- 2 I was initially struck by the scarcity of sociological accounts which examined how technologists put virtual reality systems together in local and concrete contexts (although an important exception is Schroeder, 1996). Those that did provide accounts of the technology tended to take journalistic (Rheingold, 1991) and/or technical determinist (Pimental and Texiera, 1993) positions.
- 3 Throughout this chapter I will be drawing on material from interviews with some of those who produce VR in the United States, New Zealand and Britain, as well as my fieldnotes from observational work in manufacturing and retail sites. Other data is also relevant here — material from websites are included, as are other textual data such as videos, books and reports, including advertising. See Methodological Section for a more detailed discussion of the material used.
- 4 I could give an intensive description of how all of the heterogeneous elements of virtual systems are worked through both abstract and generalised design processes. I have approached this discussion in a slightly different way because my focus is less on specific cases than on the points of connection between them — in sites and locales which are geographically dispersed. As such, I want to look at the interrelationship of both production and consumption processes, and thus regard design as one element of a network of processes which construct computer and new communications technologies. See Mansell (1996) for a discussion of design issues.
- 5 In this respect, the approach at least partially derives from interactionist and interpretive perspectives in sociology which focus on 'micronegotiations'.
- 6 In Bijker's (1997) review, he also includes 'users' practice', 'perceived substitution function', and 'exemplary artefacts'. These elements of a technical frame build on the model he develops which identifies a number of user groups as 'relevant social groups' in the construction of an artefact. As these elements of a technological frame refer primarily to 'users' whose participation I have at this point already addressed, I shall concentrate here on the participation of designers and producers.
- 7 Frames are relatively specific because they include forms of practice which cohere around *particular* artefacts, but those artefacts also overlap in multiple ways. Thus, 'VR engineering' is a frame which is closely related to both 'electrical engineering', or 'optical engineering', or even 'computer graphics' (and there are 'frames' which are both more broad and less specific than these rather arbitrary names). Actors work with multiple (sometimes even contradictory) frames which can be closely related.
- 8 'Hardware' in some cases also includes physical objects which house the computer, such as Virtuality®'s 'pod'.

- 9 These frameworks are revised through the 'interpretive flexibility' of the artefact in use, as its meaning differs amongst groups in micropolitical practice.
- 10 Linda Jacobson's (1994) book *Garage Virtual Reality* is one of the most readable introductory texts for those beginners, like myself, who are (relatively) unfamiliar with computer technology in general, and virtual reality technologies in particular.
- 11 For two useful discussions of the dynamics of craft skills see Dorinne Kondo's (1990) *Crafting Selves*, and Gary Alan Fine's (1996) *Kitchens*.
- 12 The myths of origin for virtual reality technologies points to a triumverate of 'founding fathers': Ivan Sutherland, a university researcher who wrote a paper on 'The Ultimate Display' (1965), Myron Kreuger (1991), an artist who produced interactive video art in the 1970's, and Morton Heilig, who produced the 'Sensorama', an entertainment unit which matched video visuals with motion and smell.
- 13 Feminist research has produced a number of studies clearly demonstrating the gendered nature of engineering disciplines, and the cultural and social organisation of technology and technical knowledge which produce such gender inequality. Wajcman (1991) argues that the very definition of technology has a male bias. Exclusion from engineering disciplines is one effect of the social construction of technology as masculine (Cockburn, 1983, 1992; Hacker, 1990). Lee and Taylor (1996) are making a slightly different point, however: that the discursive construction of engineering as rational, masculine and deterministic are some of the only positions also available to women, and that there are therefore 'strong reasons why women on the whole actively desire not to participate in the project of 'engineering' as it is currently conceptualised and practised' (1996: 59-60).
- 14 This is demonstrated most clearly in Martin's comments in a discussion about software development. He says '[i]t's amazing to see how many people in VR will just not look anywhere, [they have a] fixed head, and then you can argue well that's because the software didn't require that they turn their head so how do you tell them that the software — can you get someone to turn their head in VR so that ... they get it ...' (Interview, Palo Alto, September 1996).
- 15 Dr. Jon Waldern came out of the doctoral program at the University of Leicester. His project (funded in part by IBM) was to 'evaluate in an empirical sense the effectiveness of the three dimensional interface that was virtual reality' (Interview, Palo Alto, June 1996). Explicitly drawing on the work of Ivan Sutherland, he explored methods for constructing 3-D data visualisation in head mounted display technologies, and developing peripherals which could position human bodily positions in relation to 3-D space. According to Waldern, 'the results were extremely positive. Clearly everybody could use it, could see it, it became obvious, intuitive, and therefore it backed up the implicit reaction of people using the system' (Interview, Palo Alto, June 1996).
- 16 Virtuality® creates its hardware and software in two different ways. On the one hand, they research and develop standardised technologies. For example, the widely distributed location-based entertainment units, or the Elysium system for VR developers, mainly for design, industrial or scientific applications. Otherwise, Virtuality® builds relationships with 'technology partners' for one-off developments. One example of this is the display system licensed to Takara for consumer

distribution, another is 'one-off' systems, paid for by the client for purposes such as advertising or training.

- 17 Popular cultural narratives have blueprinted exactly this kind of technology, from William Gibson's *Virtual Light* (1993a) to 'Johnny Mnemonic' (1993). Indeed, in the discussion I had with Jon Waldern, his description of engineering processes is apt. When I asked him whether others' 'dreams' (such as those of the fiction writers mentioned above) influence the construction of the technologies, he replied that 'as much as Hollywood sets quite interesting expectations ... very insightful expectations in some cases ... it does take a little while to actually marry that up with the real stuff ... I think that if you look at their dreams, it's not dreams, it's actually based on canvassing very intelligent, highly respected scientists and engineers themselves ... [C]learly canvassing other creativity and other ideas is a part of [engineering] ... [In a movie], somebody was going to have to make a model. When he made the model he had to get the grips in the right place, and he had to get the weight balance distribution ratio right, probably somebody consulted somebody else about holographic optics, and about how you can create complex polymers so that you can actually incorporate the LCD [liquid crystal display] into the visor itself ... it's a bit like watching Star Trek. I'm an avid ... Star Trek fan because of the ... knowledge and the depth of highly credible science that backs up that show' (Interview, Palo Alto, June 1996). Popular culture is thought to canvass already existing expertise in science and technology, but then itself influences the development of technologies in so far as engineers attempt to 'marry up' some of those fictions to technical realities. Michael Heim (1993a: 58) argues that the holodeck provides a benchmark for VR design, and 'draws the research onward'.
- 18 Here virtual experiences are not 'other', but intricately related to and embedded in the 'real'. The physical world cannot be shut out for reasons of safety.
- 19 I heard numerous accounts of such work in my interviews, especially in 'bespoke' software applications work which were produced to hard and tight deadlines. Doreen Massey (1996) in particular talks about the gendering of engineering practice through the construction of time and space into public and private worlds.
- 20 Haddon's (1992) research argues that personal computers were gendered by coming out of this framework. See also Kirkup (1992: 270-271).
- 21 The evil Dr. Flaxon's website is <http://www.sonic.net/~dfx/fait/>
- 22 This is the case in both immersive virtual reality technologies and (to a lesser extent) the world wide web. Internet technologies had significant early input by experimenters, hobbyists, and people who were interested in developing the technologies to connect people across wide distances over time. The public bases through institutions such as universities has since been eroded, and the internet opened to private enterprise.
- 23 The newsgroup maintained by the HIT Lab at the University of Washington at Seattle is sci.virtual-worlds.
- 24 It should be remembered that 'not counting the computer' is an important phrase. If one does count the computer, barriers to access become more obvious.

- 25 VRML (Virtual Reality Markup Language) is a computer language used for graphics in 'real-time' interactive worlds, such as those which can be distributed on the internet or world wide web.
- 26 Ellen Ullman (1995: 135) reflects on some of the processes of software development, and embeds them in a social context organised around engineering cultures. Her 'reflections on the programming life' are worth quoting in full here: 'To express the idea of being "closer to the machine", an engineer refers to "low level code." In regular life, "low" usually signifies something bad. In programming, "low" is good. Low is better. If the code creates programs that do useful work for regular human beings it is called "higher." Higher-level programs are called "applications." Applications are things that people can use. Although it would seem that usefulness by people would be a good thing, from a programmer's point of view, direct people-use is bad. If regular people, called "users," can understand the task accomplished by your program, you will be paid less and held in lower esteem. In the regular world, the term "higher" may be better, but, in programming, higher is worse. High is bad. If you want money and prestige, you need to write code that only machines or other programmers understand. Such code is "low." Its best if you write microcode, a string of zeros and ones that only a processor reads. The next best thing is assembler code, a list of instructions to the processor, but readable if you know what you're doing. If you can't write microcode or assembler, you might get away with writing in the C or C++ language. C and C++ are really sort of high, but they're considered "low." So you still get to be called a "software engineer." In the grand programmer scheme of things, it's vastly better to be a "software engineer" than a "programmer." The difference is about thirty thousand dollars a year and a potential fortune in stock.'
- 27 Martin argues that 'The programmer might be brilliant at making something come to life on the screen but ask him to draw something – it's particularly difficult' (Interview, Palo Alto, September 1996). This reinscribes the boundaries between the technical and the artistic. Note also that the programmer is necessarily a 'he'.
- 28 Of course, there is interactivity within worlds, and interactive installations are becoming more widespread beyond immersive virtual reality technologies. See Michael Heim (1998) *Virtual Realism*., Jon Dovey (ed) (1996) *Fractal Dreams: New Media in Social Context*, and Mary Anne Moser (ed) (1996) *Immersed in Technology: Art and Virtual Environments*.

Chapter Nine: Revisioning the Virtual

- 1 McKenzie Wark (1994) and Judith Butler (1992), amongst others (Robbins, 1994), have pointed to the construction of 'virtual' subjectivity through the digitally mediated, abstract and televised point of view encapsulated in the 'bomb's eye' (as it was affectionately named) at the business end of a Gulf War missile. Such mediation via digital and visualisation technologies is familiar for those in the VR industry, who produce head mounted displays for airforce pilot training and combat simulation. Those in the United States who are involved in the virtual reality industry are aware of some of the ironies of such media spectacles for their profession. Ben Delaney, editor of the now suspended Cyberedge Journal told me that their first ever mailout of the industry magazine was carried out on the night of the first strike of the gulf war. He said that he was 'sitting there stuffing envelopes with a magazine (about the

virtual reality industry) as 'we' bombed Iraq on television' (Interview, Berkeley, June 1996).

- 2 This warranting occurs not only via physical presence, but via other mobile, physical markers such as personal documentation, forms of legal, bureaucratic/ state warranting — the paper trail which purportedly guarantees an identity. The difference is that modes of digital warranting are more malleable, more open to change.
- 3 The negotiation of the virtual in the form of commodities into private space is ongoing. Although the engagement of the body remains central in public space VR, the dynamic of that engagement and participation in virtual worlds could change significantly depending on the spaces in which it is accessed. See Haddon (1992), Mansell and Silverstone (1996) Silverstone and Hirsch (1992a), Terry and Calvert (1997).
- 4 One rather peculiar feature of this discussion is that Heim (1998) links the 'Unabomber' — an individual responsible for several personally directed and malevolent mail bombs to technologists over a period of several years (and who demanded publication of his manifesto entitled 'Industrial Society and Its Future') — with such academic theorists such as Ellul (1990), Baudrillard (1980, 1983), Brook and Boal (1995), Kroker and Weinstein (1994), as well as technology writers such as Rushkoff (1994), Slouka (1995), and Stoll (1995). Besides the significant differences amongst approaches and analysis in this list, to posit a connection between the criticism of technology and the activities of a clearly disturbed individual is highly problematic, not to mention highly ideological.

METHODOLOGICAL SECTION

Studying the Virtual I

- 1 Such a text would demonstrate that I generated specific research questions, drawn from a close reading of defined literatures, which prompted a well-defined methodological approach, which identified analytical categories, which generated particular 'results', which I then 'wrote up' as critical, sociological arguments. Unfortunately, my research project, like that of so many others, is somewhat more messy than this.
- 2 This desire emerges from an institutional (and cross-national) construction of knowledge practices in which the role of scholars in the academy has been to pronounce upon 'Truth', the scholar being the master subject of that truth (Haraway, 1991a, 1992). I would like to incorporate a critique of those forms of knowledge production, and in doing so appeal to very different (although influential) conventions for reflexive scholarly work.
- 3 According to Bernstein (1992), graduate students have more to lose by deconstructing the 'objective disembodiment' of knowledge as a result of their institutional position as 'liminal' (Deegan and Hill, 1991). Bernstein (1992: 126) argues that reflexive theorising in texts 'is ... a prerogative, a professional luxury that some academics can afford better than others.' Institutional limitations in the

form of doctoral degree structures and requirements, methods of examination and codes of theorising and researching within disciplines (and even departments) are constraints in the production of both 'objective' and 'reflexive' accounts for those writing dissertations, sometimes even more than for those who examine them.

- 4 I attempt to recognise how I am representing the research, as well as the ways I did the research, as well as outlining my reasons and rationales for doing that research in particular ways. Neither this discussion, nor any of those following (nor, for that matter, the arguments as the 'results' of 'analysis') represent 'the research process'. Rather, this methodological text is (as is the rest of the thesis) a construction — not only of the 'realities' of research and researcher, but also of time, relations, and events.
- 5 There has been much debate in feminist social science as to what constitutes feminist research (Stanley and Wise, 1993; Reinharz, 1992; Fonow and Cook, 1991; Stanley, 1990; Harding, 1987). According to Stanley (1990), for example, the distinctive features of feminist work is that 'by about and for women'. In many cases, however, these descriptive criteria don't hold (see Kelly, Burton and Regan, 1994; Maynard, 1994; Maynard and Purvis, 1994). Some argue that research is feminist when it cultivates the development of a particular sensibility to how feminism informs methodology and methods (Reinharz, 1992; Stanley and Wise, 1993). What constitutes feminist enquiry is, beyond doubt, contested.
- 6 The category of 'Woman' is contested in discourse and multiple in practice (Riley, 1988). There are many groups of 'we' in such a category, but remaining partial requires the declaration and use of such a category in specific times and places.
- 7 My initial 'feel' for the field — on which I was basing my emerging methodology — informed the ways I conceptualised the VR industry. Especially in an industry such as computing, the enduring connections between sites were more important than physical sites themselves, which often sprang up and just as quickly disappeared in a very 'rhizomatic' kind of way. Even though most of my links had a conceptual as well as methodological and practical genesis, I generally went first with what 'worked', and what felt right to follow in that particular social world in terms of what participants in it told me about themselves.
- 8 In other methodological pieces, this would be cast as a discussion of 'sampling'. Marcus' (1995) point is that in a reflexive and located mode of research, the object of research and the research processes are constructed together. 'Sampling' cannot occur in a positivistic sense as the 'samples' emerge from the research process.
- 9 These categories are organisational rather than hard and fast conceptual (or empirical) differences. They interact to a significant degree, and the process of action and interaction in a field will frame how events and relations are 'named' as objects or stories. Many of the 'objects' followed are techno-cultural 'composites'. In Haraway's (1992: 298-299) terms for example, 'material-semiotic actors' are part of an apparatus of bodily production, whose boundaries are made 'objective' in interaction (including 'delegated' interaction) amongst humans and machines. Neither 'objects' nor 'bodies' (nor 'signs') pre-exist as such.
- 10 The issues around conventionally 'naming' or defining the 'subjects' of the research are not at all clear. Those who are participants in this research as 'people that I followed', for example, are simultaneously colleagues producing knowledge about virtual reality technologies, with whom I am in active debate.

- 11 One means to make analysis explicit is the use of a tool such as a computer programme for qualitative analysis. I had looked at using computer packages to organise the research materials for analysis, but didn't follow that path for a number of reasons. Firstly, only the interview materials were transcribed into computer format. The other materials that I was using, both primary (fieldnotes, field journals, drawings/ maps, memos) and secondary (printed interviews, video materials or still images) were all either in analog form (they were handwritten or printed), or were in digital form (video) but not amenable to analysis by the packages to which I had access. Secondly, the hardware required to run such analysis was also beyond my means at the time. It would create more work than was necessary to transform such data into digital form (although perhaps appropriate given the themes of the thesis?). The third, and deciding factor, was the knowledge that the computer only ever *assists* the researcher in their analytical task. The researcher can equally (and sometimes more subtly and reflexively) generate and apply analytical categories to texts. As my materials were not physically unmanageable (only a few boxes), and relatively dispersed amongst different kinds of materials, I decided to use myself as the primary analytic tool.
- 12 The notion that 'qualitative' methods in and of themselves stand as oppositional critique to quantitative methods is actively contested. Some social scientists who use qualitative methods insist on its validity, if not its reliability, in the same sense as quantitative data can be both valid and reliable. An example of such analysis would be content analysis of qualitative materials, which can be measured in various ways for its validity and reliability (see, for example, Silverman, 1993). Similarly, others insist on the complementarity of qualitative and quantitative methods (Fielding and Fielding, 1986)
- 13 Bryman and Burgess (1994) discuss the methods and role of 'grounded theory' (Glaser and Strauss, 1968) in qualitative sociological research. Bryman and Burgess (1994: 221) suggest that the process of 'grounding' theory — using theoretical means, to interrogate research materials, to produce further theoretical frameworks — has become common in qualitative research. Often authors employ it as a 'general disposition' in their work, without following the prescriptions of the method in its entirety. Such is the case in my research (see also Burawoy, 1991, 1998, on the importance of grounded theory in the extended case method, as well as Hammersly and Atkinson, 1983: 174).
- 14 Generalisation is an issue of both 'sampling' and analysis (Watson, 1994: 7), which sometimes sit uneasily with the lived realities of those who participate in the research.
- 15 Also of note are those scholars who focus on the deconstruction of narrative biography and autobiography (Denzin, 1997; Aldridge, 1993; Stanley, 1990). Aldridge (1993) argues that just as these narrative genres can be analysed and deconstructed as representative of a life, so too can research texts be deconstructed as an element of a researcher's 'autobiography' (see also Cotterill and Letherby (1993), Bernstein (1992) and Jones (1992)).
- 16 Feminist critiques of knowledge have been instrumental in enabling this deconstructivist moment, both in their initial criticisms of male dominated histories as exclusionary (and their rewriting of herstories/histories), but also in further addressing the very grounds of western knowledge practices in writing and representation, particularly those of social research (Harding, 1987).

- 17 Lacan's formulation is that the 'real' is that which is outside the symbolic, that which is unrepresentable.
- 18 Just as scholars have turned to the deconstruction of social research texts as representations of reality, a number have also begun to deconstruct the relationship between researchers and the ethnographic texts they produce. Most notable of these amongst ethnographic texts is Clifford and Marcus' (1986) *Writing Culture: The Poetics and Politics of Ethnography*.

Studying the Virtual II

- 1 As was discussed in 'Studying the Virtual I' on methodology, the use of the word 'case' is problematic in this research, as it is associated with approaches such as the comparative case method. Its use here serves as a general indication of different objects, sites and groups.
- 2 I dislike the terminology of 'access' — not only because it invokes the formalised terminology of social science, but also because the notion that social researchers need expend energy to 'gain access' implies difficulty and 'otherness'. It thus underlines difference, and ignores the possibilities and problems associated with being an 'insider'.
- 3 'Access' depended both on fortune and on existing contacts, and the relative importance of each differed with time and place.
- 4 Gaining the trust of others in the field is a question of ethics, and a reflexive consciousness of the issues of honesty, trust and reciprocity involved in research relationships. According to feminist scholars, these relationships are implicated in the politics of equality and social change embedded in feminist projects. Some argue that such issues are so fraught that 'research' as it is commonly understood in the social sciences is impossible (Stacey, 1988). Others argue that the dilemmas faced offer opportunities to create dialogue between a researcher and her participants (de Vault, 1991).
- 5 In relation to access in particular, there is sometimes an implicit assumption that some deceit will be employed to negotiate entry to the field.
- 6 This social power differs from the power of research participants *within* the research to withhold information or participation in the research.
- 7 I could mould my personae in accordance with these attributes and interests in the field, through crafting the clothes that I wore, doing femininity work (Smith, 1990) to the standard of other women involved in the different groups I worked with. The setting also had an effect on how I presented myself to others (Goffman, 1969). There are dilemmas for feminists participating in the femininity work which goes in to reproducing particular versions of gender presentation. See Dorothy Smith (1990).
- 8 There were exceptions to my familiarity with the languages spoken in the settings I entered. Some sites I visited were in countries where languages other than English were (primarily) spoken. This is particularly good for the practice of observation

skills (I), and is discussed in ethnographic literatures as a particularly difficult, but important part of fieldwork. Situated outside of language, researchers can more easily remove themselves from the meaning generated through spoken words, and orient observation to meaning generated through bodily action and interaction such as the use of space and time.

- 9 Unlike some authors, who have identified particular problems with being an insider, I encountered no such problems. If there is an issue here, it is exactly that I am/ would be unaware of them. I think the only 'solution' in the field is to try and be as reflexive as possible about what you might be missing as a comfortable part of the scenery.
- 10 Sites such as conferences, computer science centres or virtual reality production firms were likely to be dominated by men (as was publicly accessible literature on virtual reality technologies, both technical and popular). Other sites, such as theme parks, were more likely to have as many women as men, in staff ratios as well as consumers (see Chapter Five).
- 11 I later learned from an independent source that the particular company to whom I am referring had been subject to a prolonged (and costly) legal battle over the form of their technology in relation to another's patent, and in relation to mutual non-disclosure agreements.
- 12 I was asked to enquire about the possibility of obtaining a copy of a virtual environment from a computer science group at another campus of my university. This was an ambiguous situation. While I wanted to take requests from potential participants seriously as a reciprocal arrangement to gain access, I was suspicious of the request because the person making the request would have been in a better position to legitimately obtain such information than myself. I remain unsure as to whether my dedication and trustworthiness were being tested, or whether I was being used as a lever to gain information not otherwise accessible to the concerned party. In the end, I made some effort to obtain the required information, but when, despite my efforts, the relevant information remained elusive, the relationship between myself and my potential participant was terminated.
- 13 I would argue that naïvete is a useful methodological strategy, and at times I was consciously working it as an element of fieldwork.
- 14 See Glucksmann (1994: 156) on 'divisions of knowledge', and the relationship between knowledge and politics in the social dynamics between researcher and researched. Glucksmann discusses the politics of knowledge in the field of her research where there was knowledge disparity between researcher and researched.
- 15 While anthropology is the originary discipline of ethnographic work, sociological approaches such as that of the Chicago school have used participation, observation and interviewing methods, although usually of a shorter duration in the field than traditional anthropological research. Other social science disciplines such as political science, economics and geography have also employed such approaches.
- 16 I would simply liked to have had more time in the field, but in practical terms it was impossible for me to do so. I found sometimes that there were interesting questions that I would have liked to follow up, but which were excluded from the thesis for lack of substantial fieldwork around those questions.

- 17 Those tomes with 'virtual' in the title sometimes had nothing at all to do with new computer or communications technologies, nor even with the physics of optics, one of the sources from whence it derives its current meaning. This points again to the extent to which the notion of 'the virtual' has become late twentieth century shorthand for anything that 'doesn't "really" exist.'
- 18 Describing participant-observation to those in the field was sometimes difficult because qualitative approaches such as ethnography contrasted strongly with the sometimes positivistic methods used by those in the field who were themselves carrying out research. Sandra Harding (1991) provides a useful discussion of feminist negotiations of positivism, objectivity, rationality, and empiricism.
- 19 Participant-observation therefore relies heavily on ethnographers drawing out issues from their experiences. Such reflections, rendered as autobiographical and situated accounts of located theorising, have recently become more important with the 'deconstructivist turn', along with advice on how to personally manage dual roles (Kleinman and Copp, 1993). See, for example, Shaffir and Stebbins (1991). Issues such as that of emotion in the field (Kleinman and Copp, 1993), or 'what really happened' confessionals, have been used to reflect on fieldwork practice, its ambiguities, traumas and problems, as well as delights and satisfactions.
- 20 There are a number of texts that I found useful as I went into the field. Some were methodological 'cookbooks', Others were not, but nevertheless suggested strategic ways of thinking about how observation and participation were taking place. See, for example, Wolcott (1995), Silverman (1993), Ely (1991), Fetterman (1989), Hammersley and Atkinson (1983).
- 21 By no means did I participate in all of the activities at all sites. In some places, such as VR firms, I didn't have the skills, and could not participate in activities like programming worlds. I could, however, discuss the conceptual and aesthetic dimensions of their design. Similarly, when in arcades, most often I participated as a consumer, and did not take on other roles, such as those of a staff member when I was there. Instead, relied more heavily on observation, and ultimately on interviews.
- 22 It is not often that techniques of observation are explicitly spelt out in ethnographic research texts. Like other elements of ethnography, observation methods have attained the status of sacred fieldwork secrets in anthropology and sociology. The student must ritually discover fieldwork techniques as a development of person as well as profession (Kondo, 1990).
- 23 The relationship of researchers with the 'sponsors' central to their research has had an extensive review in ethnographic literatures. The most famous informants are those such as 'Doc' in Whyte's (1955) *Street Corner Society*, 'Tally' in Liebow's (1967) *Tally's Corner*, or more recently 'Slim' in Duneier's (1992) *Slim's Table*. Some feminist researchers have, however, begun to deconstruct the 'key informant' as instrumental person/ individual, and have pointed to how these persons are nodes amongst networks, representative of collective knowledge and network rather than repositories of exclusive knowledge (see Wolf, 1996).
- 24 As I discussed in Chapters Two and Four, I needed to learn the consumption of virtual reality technologies as technical systems. In my research practice, I also needed to learn specific dynamics of the worlds of virtual realities. I had to develop my knowledgability of industry and its activities, as well as learn the organisation of consumption sites, and some of the modes of consuming VR therein. The process of

acquiring this competence provided a central analytical resource for the research, as my process of learning provided a map of how competence is acquired in these social worlds.

- 25 The history of sociology in the late twentieth century is littered with examples of 'unobtrusive' methods, and such methods have been subject to intense critique (see, for example, Humphreys, 1975). Methodologically, the issues centre not only around ethical issues, but also what research materials are thereby produced. Fine (1996) argues that ultimately there is little point in concealing observation, as the research materials thereby produced are limited.
- 26 These vignettes were not necessarily about any particular individual. Above and beyond what I considered to be an ethical obligation to feed back interview materials to as many participants as possible, and parts of the thesis itself, I also interrogated the point at which the narratives I generated could be attributable to any particular individual in all their specificity.
- 27 While these characters appear in the research, their presence is more peripheral than others with whom I spent much longer periods of time, or with whom I conducted more formal interviews. Time is an important dimension in gaining a depth of understanding of particular worlds, and brief encounters with a range of individuals provide a counterpoint to, rather than the substance of, the analytical materials.
- 28 One issue that emerges using interview material generated by others is a question of how far they might have been edited, especially material which might be considered 'promotional'. A case in point is the interviews attributed to participating individuals in the case of promotional materials for OSMOSE© on the Softimage® Inc. website.
- 29 Phrases such as 'face to face' (ftf) or 'in real life' (irl) have emerged from digitally based communities in the internet to differentiate different forms of social contact. Digitally mediated activity is differentiated from 'real' activity when the activities being described can occur in both realms — such as the activity of interviewing.
- 30 With the help of Antoine Monti, at the behest of the Department of Sociology at the University of Canterbury, when I contracted repetitive strain injury halfway through my doctorate. Thank you.
- 31 At times, taping worked very well. At other times it was problematic, especially when I had sometimes to interview 'on the spot' with no choice of environment. Sometimes background noise interfered, as it did with espresso machines in cafés, or traffic noise on the freeway, or in malls next to car parks — all sites where I interviewed.
- 32 There were times in my research where my position as a young woman in a field dominated by men became difficult because of participants attempts to establish intimate relations. This is not a 'confessional' claim made for rhetorical effect, but rather to draw out my own reactions to those events as informing the ongoing research. Such moments brought home to me forcibly, and at a very personal level, why such research was imperative in the emerging social worlds of VR and other new communications technologies, and why I felt compelled to construct the research in the way I have. I simply forget, at times, relatively privileged as I am, that such blatant and personal expressions of gendered power continue to be practiced.

- 33 There are two comments to be made here. The first is that while race was not rendered problematic in interviews because of similarities between myself as interviewer and 'white' interviewees, it is also the case that 'whiteness' is hegemonically constructed as non-racialised. Research participants could therefore render 'race' unproblematic because they (and, by implication, I) were not 'raced' (although some people did ask me where I got my 'colouring'). The second comment to be made is that the dynamics of 'race' in this research are insufficient to theorise how 'race' works in the field of virtual reality technologies. My research has limited scope in this respect, both because of the limited time and range of relations at each site, and because it does not necessarily reflect some of the international aspects of virtual systems research as I only interviewed in European, North American and Australasian countries. There is a strong VR research and development program (and significant consumption) in Japan, for example, and the relationships between researchers from different nations and ethnic groups would have some bearing on the theorisation of 'race' (see Schroeder (1996), Rheingold (1991)).

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A note on conventions:

Just as virtual reality technologies have troubled conventions of embodiment and subjectivity, so too have communications technologies such as the internet and world wide web troubled a sense of 'place', origin or authority. This not only means that the designation of 'place' is different to that of print sources in bibliographic trails. It also means that research *sources* can emerge and fade (sometimes never to be seen again), and also that specific conventions of print sourcing are no longer relevant in an electronic realm (for example, often digital texts bear no page numbers).

Here, I have attempted to reference electronic sources as completely as possible, although some websites no longer exist, some content changes, some bulletin board threads are not archived (or are only archived for a short period) and some articles (and quotes from them) bear no page numbers. While the authority of 'the author' is challenged via such means (Barthes, 1977), it also offers opportunities for a new politics of knowledge which attend such uncertainties, and interesting cross-fertilisation of sources, disciplines and social worlds.

With such a note, I offer an 'archeology' (Foucault, 1972) of a research project:

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